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An Economical Canal and Coastwise Tanker Service

Some Facts Concerning the Operation of a Fleet of Eight Diesel-Driven Barges of the Standard Oil of New York

ATTENTION has been drawn from time to time to the growing importance of the New York State Barge Canal as a field of application for heavy-oil engines, as our readers will recollect. Having early realized what the possibilities of this great waterway are, MOTORSHIP years ago set out to bring clearly to the attention of its readers the opportunities which it offered and is still offering for pronounced increases in the application of oil-engine power—particularly as soon as the State maintains the designed 12 ft. depth throughout.

Since the canal traverses a densely populated area of the richest and most populous state in the Union and links together the focus of a great nation's industry with the world's foremost seaport, it is not surprising, after all, that the means of transportation used on it should be a matter of vital interest. The Standard Transportation Co., a subsidiary of the Standard Oil Co. of New York, is one of those which has taken a serious view in this important matter. This became evident years ago when they put into service internal-combustion engined tank barges and is now given additional emphasis by their commissioning eight large twin-screw Diesel-driven vessels of approximately 650,000 gallons capacity each. In fact, they probably owned the first oil-engined craft of this type in the country. Although the Barge Canal is paralleled by a number of important trunk line railroads, the extreme congestion of the industrial district of this area is such that traffic cannot be satisfactorily handled by the railroads alone, and delays and interferences with service are of common occurrence if land transportation is depended upon.

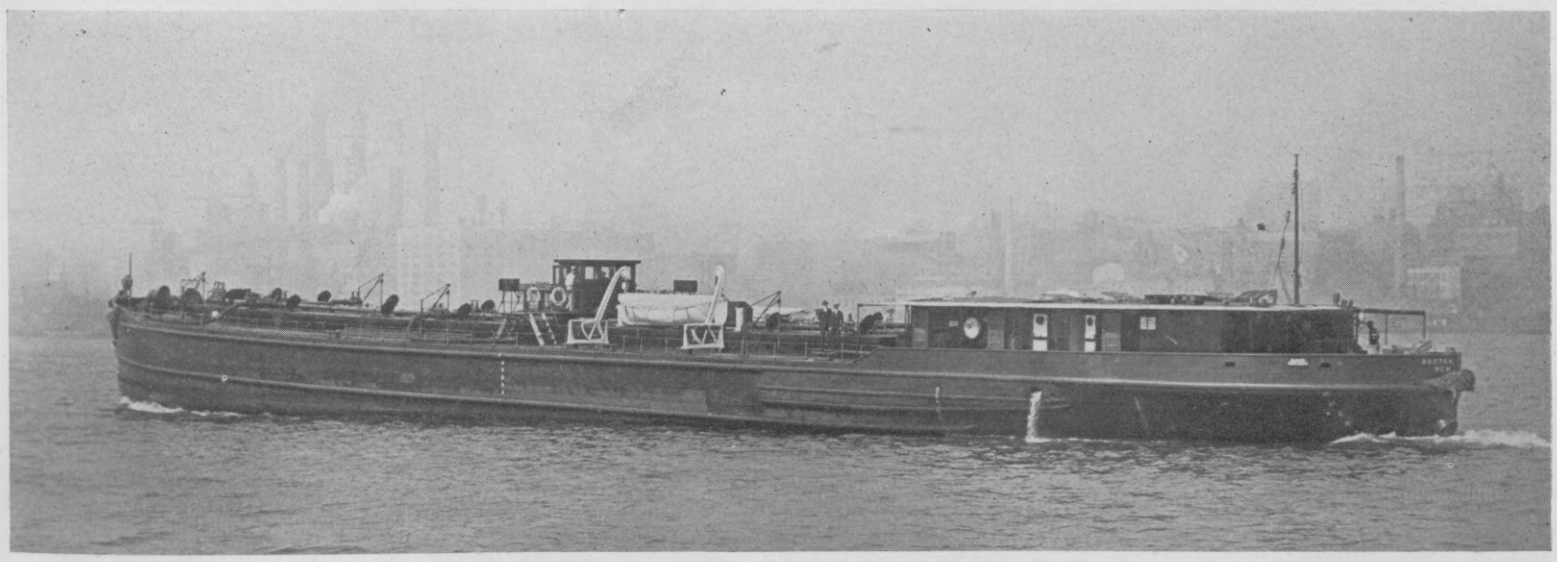
Although of low freeboard these new boats are of very seaworthy design, as in addition to the trip down the Hudson River from Albany to New York, they are operated in the coastwise service as far as Providence and Boston, and can run anywhere down the Atlantic Coast if desired by the owners. So they may well be termed combination canal and coastwise craft. The illustration shows their distinctive design, and how they differ from any other class of commercial craft.

Many years of experience with tank cars and resultant delays, inconveniences and losses occurred by failure to get their products shipped into the interior of the state, caused the Standard Oil Companies and their subsidiaries to take advantage of the splendid opportunities offered by the Barge Canal for relieving them of a large share of their troubles. The water route gave them the opportunity not only of achieving substantial savings over the cost of transportation by rail, but also put into their hands effective means of ridding themselves once and for all of the delays and uncertainties caused by chronic railroad congestion in this district.

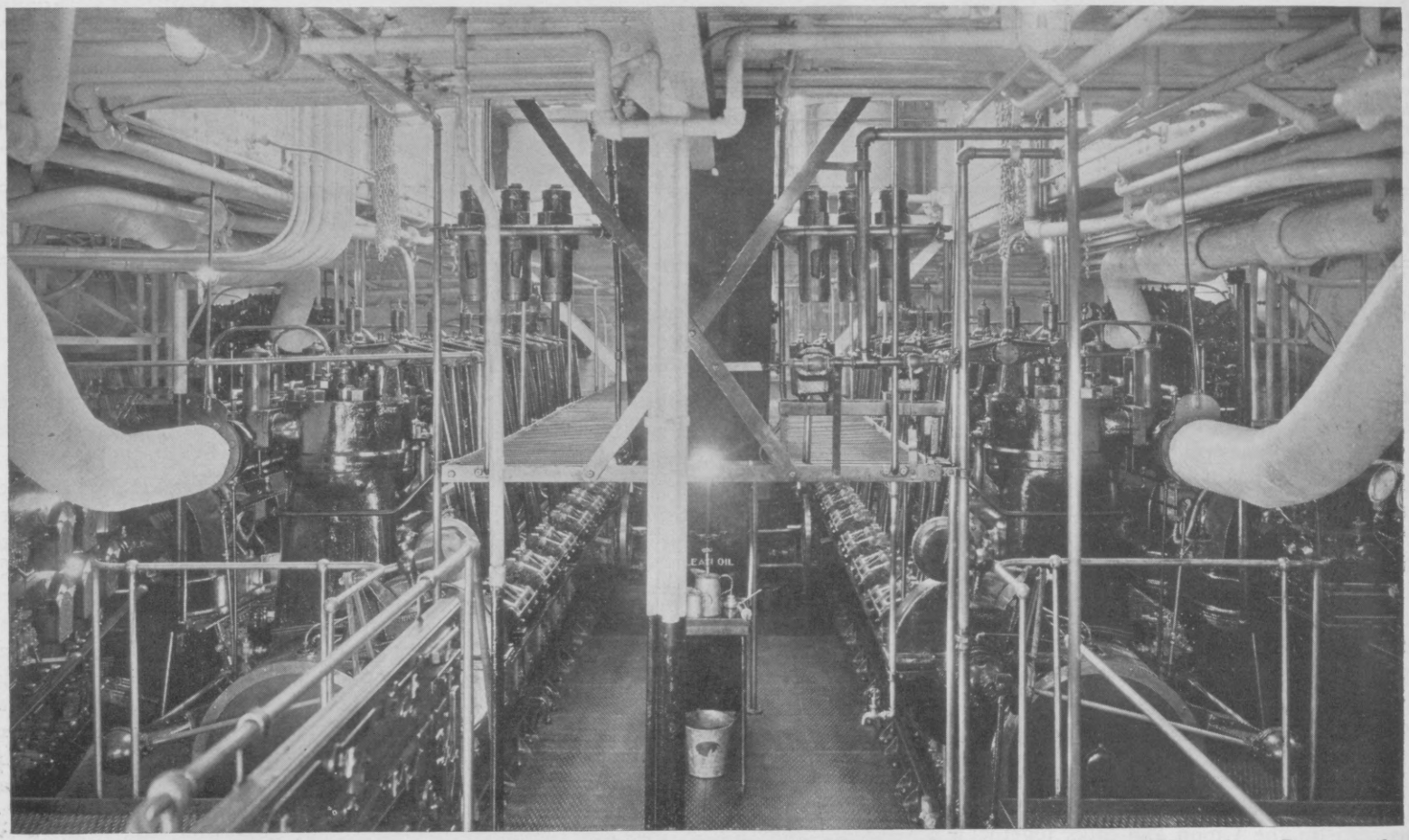
Constituting, as they do, one of the most important deep-sea and coastwise shipowning and ship-operating concerns in the United States, the various Standard Oil companies and subsidiaries have acquired much valuable information and experience in the design of all kinds of inland and seagoing craft suitable for the transportation of petroleum products. They employ several independent staffs of naval-architects and marine-engineers who do nothing but design new vessels for them and maintain their existing ones in the highest state of efficiency and economy. We mention this merely to make up for the difficulty confronting the writer of an article so short as this is in presenting all the facts concerning the vessels which the Standard Transportation Co. recently commissioned, complete descriptions of which would fill treatises many times the length of the one which now occupies these pages.

Starting out with the idea of utilizing the Barge Canal to the fullest extent permitted by the dimensions of the locks, the Standard Oil naval architects laid down the designs of the following eight Diesel-driven tank barges which we list as follows:

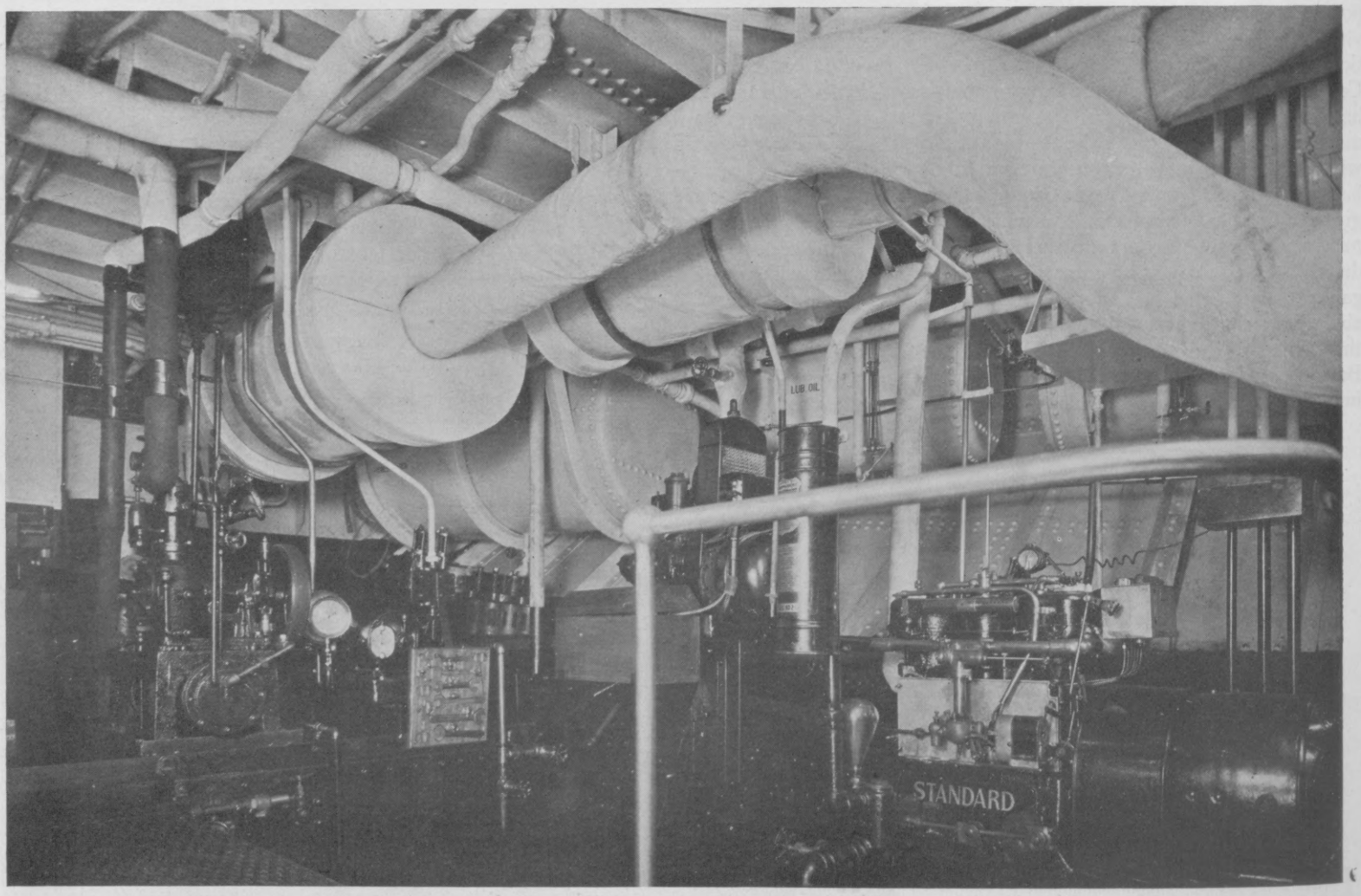
PROVIDENCE	SOCONY	Built by New York Shipbldg. Corp., Camden, N. J.
HARTFORD	"	
BOSTON	"	



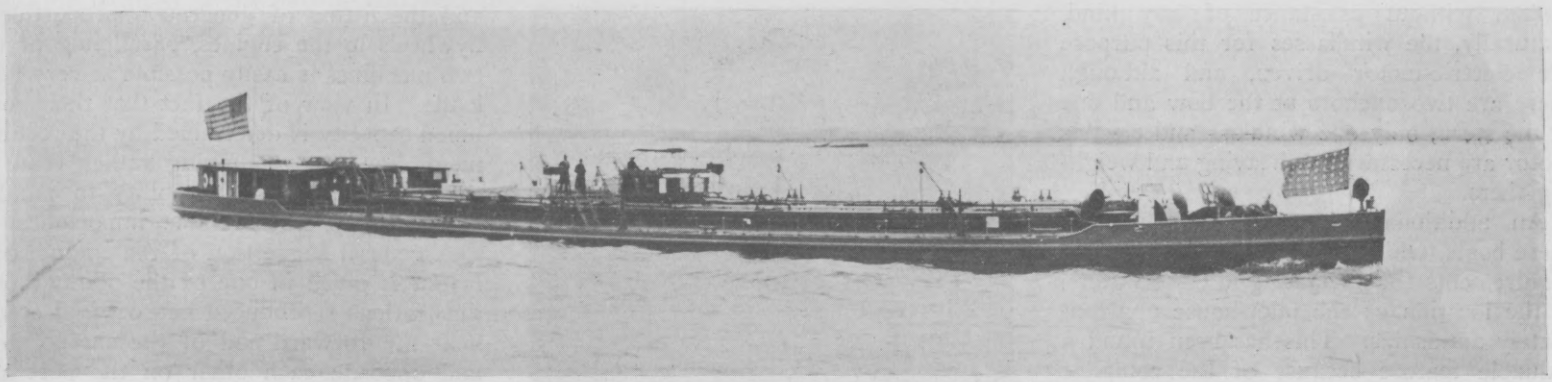
The "Boston Socony" easily does better than 10 knots in the light condition as shown above. She is one of the fleet that helps the Standard Transportation Co. to furnish express service to the up-state customers of the Standard Oil Co. of New York



McIntosh & Seymour direct-reversible Diesel engines on the "Boston Socony." They are of the integral-frame construction. Because of foreshortening the spare exhaust valves appear disproportionately large



Refrigerating machine and auxiliary generator; the small unit to the right automatically starts and furnishes current for the lights when the normal supply fails. Suspended from the underside of the deck are the lagged exhaust pipes and silencers



One of the "Socony" boats shown loaded to the gunwale. A comparison of this picture with the other view gives a suggestion of the large capacity of these vessels

SCHENECTADY "
AMSTERDAM "
ROME "
OSWEGO "
BURLINGTON "

} Built by Sun Shipbuilding Co., Chester, Pa.

The following are the principal specifications of these vessels:

Displacement, *loaded*	2,760 tons.
Displacement, *light*	860 tons.
Cargo Capacity (in deep water)	680,000 gals.
Max. Net-Cargo Capacity (gasolene)	1,883 long tons
Max. Net-Cargo Capacity (kerosene)	2,049 long tons
Deadweight Capacity on 12′ dft.	1,900 tons.
Gross Tonnage	1,199 tons.
Net Tonnage	753 tons.
Power, total	700 s.h.p.
Engine Speed	265 r.p.m.
Ship's Speed, *loaded* at sea	9 knots.
Ship's Speed, *light* at sea	10½ knots.
Ship's Speed, *loaded in canal*	5 knots.
Daily Fuel-consumption, *at sea*	3 tons
Daily Fuel-consumption, *in canal*	1.1 tons
Power Developed, loaded in canal	App. 300 s.h.p.
Power Developed, loaded at sea	700 s.h.p.
Daily lubricating-oil consumption	8 gals.
No. of Engines and Propellers.	2 of each.
Length of Ship o.a.	260′ 0″
Length b.p.	252′ 0″
Breadth, md.	40′ 0″
Depth, md.	14′ 0″
Draft, ld.	12′ 0″
Main Engine Builders	McIntosh & Seymour.
Aux'l. Engine Builders	Pacific Diesel Engine Co.
Shipbuilders	Sun (5) and New York (3) Companies.

It will be recalled that the extreme length of the New York State Barge Canal locks is 300 feet, with a width of 45 feet, and that the navigable depth of the channel is kept at 9 feet 6 inches. It will, therefore, be seen that when on the canal the barges will not be loaded quite to full capacity in order to provide for bottom clearance. Dredging the canal to its proper depth is urgently needed. Owing to their sturdy and sea-worthy construction it is possible, as stated, for these barges to navigate in the coastal and inland waters of the Northern United States throughout the winter months with a full load and a thorough utilization of the equipment and capacity which they represent is therefore anticipated.

They are built entirely of steel, special precaution having been taken to make them suitable for the transportation of gasoline. Seven oil-tight compartments are provided and a separate pump-room in the bow has been built in. A notable feature of the latter is that it is sub-divided into two spaces, one for the electric pumps and the other for the cargo pumps. This detail alone would indicate that the same care and faithful attention to detail as govern the design and construction of these vessels as would have been exercised in building a large seagoing tanker.

Due attention has also been paid to the requirements of canal navigation as illustrated by the use of two sets of anchors and windlasses for them, namely, two anchors in the bow and one in the stern. To the uninitiated the use of the stern anchor might be puzzling for a moment until it is reflected what would happen if the barge were coming down a narrow channel with the current and had to stop. If one of the bow anchors were to be dropped there would be nothing to prevent the stern from swinging around with the current and damaging the propeller and rudder on the banks. By dropping the stern anchor, the difficulty is avoided and the barge remains pointing neatly down

Deck view of the "Boston Socony" showing the deckhouse amidships and cargo-tank tops

General engine-room view showing small space occupied by engines and ample crane facilities

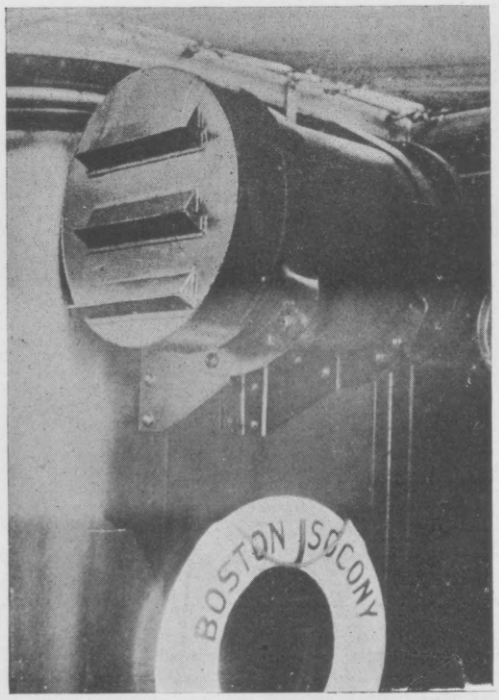
stream without assistance of any kind. Naturally, the windlasses for this purpose are electric-motor driven, and although there are two anchors at the bow and one at the stern, only one windlass and electric motor are necessary for heaving and weighing them.

An additional constructive feature of these boats, which also has its origin in the requirements for navigating in close waters, is the location of the pilot-house approximately amidships. This has been found a valuable feature because of the complete and unobstructed view which it gives the pilot of all sides of the vessel. It is fitted with electric steering gear control and is kept in communication with the engine room through the most modern telegraph and signaling system.

Propelling power is furnished by two Diesel engines rated to develop 350 h.p. each at 265 r.p.m. They are McIntosh & Seymour's four-cycle six-cylinder, direct-reversible type, and are therefore flanged direct to the propeller shafting without the use of intermediate mechanism of any kind. Their complete flexibility and ease of maneuvering in both directions would appear to make any such contrivances superfluous. An important consideration in the choice of this machinery is also that it has a very low fuel consumption, a fact appreciated even by a firm so rich in fuels of all kinds as the Standard Oil Company. Particular attention has also been paid in the adaptation of these engines to marine requirements, notably that of rigidity in the framing. The box frame and water jackets are cast integral in a single unit of smooth, graceful outlines, reaching from the bedplate up to the cylinder head joints. It is easy to see that such a construction would have great inherent strength and would be well adapted to maintaining the alignments of all the moving parts no matter how severely the hull might be strained as the result of heavy weather or other causes. Except for the force-feed lubricators for the cylinders drip-feed lubrication is employed, so the necessity for piping oil under pressure to the various parts requiring lubrication is thereby avoided.

In the course of a trip which we were recently privileged to take on the Boston Socony we were impressed with the ease and certainty that characterizes the maneuvering. While the ropes were being cast off no preparations were going on in the engine room, but at the very first signal for starting given by the engine-room telegraph the order was obeyed with precision and as a matter of course. Incidentally, the dial and handle of the telegraph are mounted directly above the engines' maneuvering controls and the movements of the mechanism for ahead have the same direction as the motion of the telegraph handle.

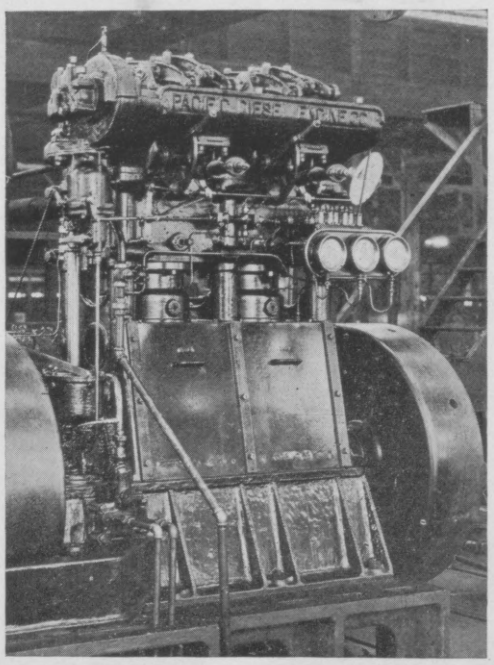
For supplying electric current to the motor-driven pumps and auxiliaries two 50-k.w. generators of rugged construction well suited to the exactions of marine service are provided. Each of them is driven by a Pacific-Werkspoor twin-cylinder four-



Air for the main engine compressor is drawn in through inlet silencer on deck

cycle airless-injection Diesel engine rated to develop 75 s.h.p. at 325 r.p.m. Both cylinders are supported in an approximately rectangular box-shaped casting which serves the double purpose of providing a rigid anchorage and forming the water-jacket. It rests on cast-iron A-frames straddling the main bearings. Running through the entire structure from the top of the cylinder box and through the frames down to the under side of the bedplate are steel tie-rods of ample strength.

Fuel is injected into the cylinders of the auxiliary engines at a fluid pressure varying from about 3,000 lbs. per sq. in, at no load to around 4,000 lbs, at full rating. Although a spring-loaded accumulator is used in connection with a constant-stroke two-plunger fuel pump, a variation of the amount and pressure of the delivery is possible and is effected by the governor control. Owing to the precise nature of the latter



Auxiliary engine for generating sets on Standard Transportation Diesel-engined tank barges

and the fitting of generously-proportioned flywheels to the engines, paralleling of the two machines is easily possible at very light loads. In view of the fact that their combined capacity is determined by the requirements for cargo pumping rather than by the auxiliary load, the ability to parallel readily is of considerable importance.

A general suggestion of the engine-room layout is given in one of the photographic illustrations reproduced herewith. Located near the forward end of the engine room and opposite each other on the port and starboard side are the two main auxiliary generating sets. Just aft of the one on the starboard side are the two motor-driven auxiliary air-compressors and opposite these on the port side is the switchboard. As the peaked end of the engine-room is approached the emergency lighting and compressing sets, ice machine, silencers, circulating pumps, etc., are found. In the background of the general view of the upper part of the engine-room the lubricating oil tank for supplying the stern tube is visible, as will be discussed more in detail presently; it is placed at such a height that the pressure from it can always positively overcome the tendency for sea-water to leak inwards past the tail shaft. A commodious work-bench located at the after end of the engine-room and running athwartships affords ready facility for carrying out the routine work of grinding valves, re-packing fuel needles, and the like.

The stern tube just referred to is distinguished by the use of a babbit-lined sleeve in place of the usual *lignum vitæ* lining. It is a well-known fact that stern tube wear is apt to be troublesome, particularly in the case of ships with engines installed aft. Whereas *lignum vitæ* forms a good journal when it is water-lubricated, it is subject to relatively rapid wear with the result that a short line of shafting to the engine is thrown more or less out of line in the course of a short time. No attempt is made, of course, to lubricate *lignum vitæ* stern tubes since it has been claimed that the lubrication of a bearing situated as this one is could be permanently successful.

The installation of the Socony, however, shows that there are other ways of looking at this problem. Instead of the unual *lignum vitæ*, an ordinary babbitt-lined bushing is used and the tail shaft that revolves in it is bare and has no protective shrunk-on bronze liner. By the use of a pressure lubricating system, clearly shown in the diagram, it has been found possible to keep this bearing lubricated, and its installation on upwards of 100 sea-going vessels would indicate that there is substance to the claims made for it. Since the oil reservoir which supplies the stern tube is located far enough above the water line to insure that there will always be an excess pressure head due to it, leakage from the system must always be outwards and can never be inwards as long as the supply of oil is maintained in the overhead gravity tank. As a further protection to insure the retention of the oil in the tube and to prevent the ingress

of water or grit, an elementary sort of packing is fitted at the outside end next to the propeller pump. As may be inferred, it serves the double purpose of keeping the oil in and the water out.

Other things being equal, engineers would naturally prefer a properly lubricated metal bearing to a water lubricated wood and metal one. Owing to the very low intensity of bearing pressure per square inch of projected area, due to the weight of the shaft and propeller, the wear is practically negligible with the result that the alignments of the shaft as well as the tightness of the stern gland are maintained for a practically indefinite period.

In this connection it is interesting to draw attention to the fact that a Diesel-driven tanker of somewhat similar size, namely, the J. H. Senior of the Standard Oil Co. of N. J. has a rubber stern tube. Consequently a comparison of the results after a year or eighteen months operation should be of some little value, and it is to be hoped that the information will be released by both companies.

A description of the boats of the "Socony" series would not be complete without a reference to the very complete silencing equipment used by them. Each one of these vessels has its silencers—two 8″ ones for each of the main engines, and two 5″ ones for the auxiliary Diesel generators, also two 4″ inlet silencers for the air intakes of the main Diesel engine compressors. The two last named are located on deck with a view to preventing the inhalation of sulphur and other corrosive fumes into the compressor mechanism. Characteristic of this apparatus is the use of scientific principles, according to which the sound waves annihilate one another by mutual interference. There is, therefore, a minimum of choking-off of the gas currents passing through them with the result that the exhaust silencers approximate the condition of a free exhaust, whereas the inlet silencers reduce the capacity of the compressors which they serve by only a negligible amount.

We have chosen only the high spots of the many interesting features in which these up-to-date vessels are bound. A great deal of interesting matter could, for instance, be written about the very complete installation of pumps, of which there are the centrifugal, the rotary and the geared plunger types. The switchboard, which was built practically to owner's specifications, could also be made the subject of an extended treatise, full of useful information for those concerned with the efficient equipment of motorships. Given above is a list of the equipment of these very serviceable motorvessels, all of which play parts in their efficient operation.

Equipment of the "Boston Socony"

Main Engines	Two 350-s.h.p. 265-r.p.m.	McIntosh & Seymour Corporation
Thrust Bearing	2 Single Collar	Kingsbury
Stern Tube	"Vista" babbited	McNab Company
Exhaust Silencer Aux. & Main Engine	Two 5-inch, 2 8-inch	Maxim Silencer Company
Suction Silencer Compressor	Two 4-inch	Maxim Silencer Company
Engine Tachometer	1 Direct-reading	Schaeffer & Budenberg
Engine Telegraph	Two	Charles Cory & Son, Inc.
Auxiliary Oil-Engines	Two 75-s.h.p. 325-r.p.m.	Pacific Diesel Engine Company
Auxiliary Electric Generators	Two 50-kw. D.C.	Diehl Manufacturing Company
Steering Engine	1 Electric Type	American Engineering Company
Switchboard	1 Owner's Specifications	Charles Cory & Son., Inc.
Engine Room Crane	1 Traveling	Maris Brothers
Chain Falls	2 Differential Block	Wright Mfg. Co.
Exhauster Fan	1 Motor Driven	B. F. Sturtevant & Co.
Signal Horns	Quadruplex	American Strombos Company
Fuel Oil Strainers	Several Sizes	The Elliott Company
Pumps	Rotary, Centrifugal & Plunger Type	Worthington Pump & Machinery Corp.
Motors	Semi-Enclosed and Watertight	Diehl Manufacturing Company
Anchor Windlass Forward, Double	Double Gypsy, Double Head	Hyde Windlass Company
Anchor Windlass Aft, Single	Double Gypsy, Single Head	Hyde Windlass Company
Auxiliary Compressors	Full-Enclosed	Winton Engine Works
Standby Compressors & Lighting Generator	Single Unit	Standard Motor Construction Co.
Pressure Gauges	Various Services	U. S. Gauge Company
Emergency Lighting Set	One Automatic	Kohler Company
Valves	Miscellaneous Services	Crane Company
Refrigerating Machine	1 ¼-ton	Brunswick-Kroeschell Refrigerating Co.
Propellers	2 Manganese Bronze	Hyde Windlass Company
Compressors	2 Auxiliary	Winton Engine Works
Cylinder Lubricators	Richardson Phenix	S. F. Bowser Co.
Electric Motors	Various Services	Diehl Manufacturing Co.
Steering-Engine Motor	Semi-Enclosed	Electro-Dynamic Company

World's Motorship Construction Equals 57 Per Cent of Steamer Construction

Lloyds Returns for the Quarter Ending September 30th Show Nearly a Million Tons of Diesel-Driven Merchant Vessels Now Building, Aside from Many Workboats, Naval Craft and Ships

ALMOST significant development in the shipping situation—states Lloyds' latest report,—is the marked increase shown by the figures for the last quarter in the construction of motor-vessels. The world total of ships ordered with internal-combustion oil-engines advanced more than 125,000 gross tons in the three months since June 30, last, and is now well on the way to the million-ton mark. Of the entire world's shipbuilding, 36.4 per cent now consists of motor-vessels, as compared with 30.9 per cent on June 30—in other words, motorship construction now equals 57 per cent of steamer construction.

The following table shows the comparison between the constructing of motorized ships and those with other forms of propulsion in the last two quarters, the figures being in gross tons:

THE WORLD

	Sept. 30,1924	*June* 30,1924
Motor vessels	939,899 tons	810,655 tons
Other types (steam and sail)	1,641,113 "	1,806,242 "
World total	2,581,012 tons	2,616,897 tons

The decrease in the construction of other vessels than motorships is marked, amounting to a decline of nearly 170,000 gross tons during the quarter. The trend towards internal-combustion engines, however, is not so marked in the case of Great Britain and Ireland as in that of the smaller maritime countries. On June 30, last, motorships represented 23.4 per cent of the British total of all construction; but by September 30, the proportion had increased to 26.4, the division of types being shown in the following table of gross tonnage covering British building:

THE BRITISH ISLES

	Sept. 30,1924	*June* 30,1924
Motor vessels	387,670 tons	355,590 tons
Other types (steam and sail)	1,080,738 "	1,161,156 "
British total	1,468,408 tons	1,516,746 tons

In the output of all the other maritime countries combined, however, motorships now represent almost half of the entire construction, the exact figures being 49.6 per cent at September 30, as compared with 41.4 per cent at June 30. In fact, these countries, although they are building a smaller total of all kinds of shipping than Great Britain and Ireland, are constructing about 160,000 tons more of motor vessels than the British. The following table shows the division of building in these countries, in gross tons:

OTHER COUNTRIES

	Sept. 30,1924	*June* 30,1924
Motor vessels	552,229 tons	455,065 tons
Other types (steam and sail	560,375 "	645,086 "
Non-British total	1,112,604 tons	1,100,151 tons

The comparison also shows that while these countries are working on nearly 100,000 tons more of internal-combustion engined vessels than they were three months ago, orders for other types of ships have fallen off about 85,000 gross tons, says Lloyd's Register.

At this juncture we should perhaps point out that in a sense Lloyds' reports are misleading as far as the internal-combustion engine situation is concerned, particularly in its reference to the United States. Seeing that it deals solely with new construction it is only natural that the steamer conversions should not be included in these

tonnage totals. Hence, the proportion of new Diesel work is really higher than is indicated from the new motorship construction figures.

Decreases in the volume of new shipbuilding in the United States and Great Britain and Ireland more than offset the gains made by other maritime countries in the last three months, so that world construction as a whole shows a decline as compared with the status at the close of June dealing with the returns from all countries for the quarter ended September 30. While the decrease of building in American and British and Irish yards totaled 86,000 gross tons, that for other countries combined increased only 51,000 tons; leaving a net decrease of 35,000 tons. The comparison between the two quarters is given in the following table, the figures representing gross tons:

	Sept. 30,1924	*June* 30,1924
United States	64,905 tons	103,665 tons
Great Britain and Ireland	1,468,408 "	1,516,746 "
Other countries	1,047,699 "	996,486 "
World total	2,581,012 tons	2,616,897 tons

One result of the decline is that the United States, which on June 30, last stood fifth in rank among the shipbuilding nations is now sixth, having changed places with Holland, although the latter country is also building less than three months ago. This is due to so many American motorship orders have gone to Europe and to conversions not being included in the figures. Practically the entire gain for other countries than the United States and Great Britain, however, is represented by the increase for Germany and Danzig, whose yards have nearly 70,000 gross tons more of orders now than at the end of June. Italy's figures are slightly higher than three months ago, but losses are recorded for other countries in the returns.

It is pointed out, however, that the world total is greater than for any quarter in the period since June 30, 1923, and is more than 200,000 gross tons in excess of the aggregate at September 30, 1923, at which time the low water mark was reached.

New orders being placed for tonnage show a decline from the previous quarter, while launchings during the quarter ended September 30 were in excess of the previous quarter. The returns indicate, however, that this is due to conditions in Great Britain and Ireland, where, during the last quarter the work commenced was over 100,000 tons less than the shipping launched. In the other countries, however, the situation improved, new work begun there being 84,000 more than the launchings. Lloyd's returns show the following comparison in gross tons; for the quarter ending September 30:

ORDERS AND LAUNCHINGS

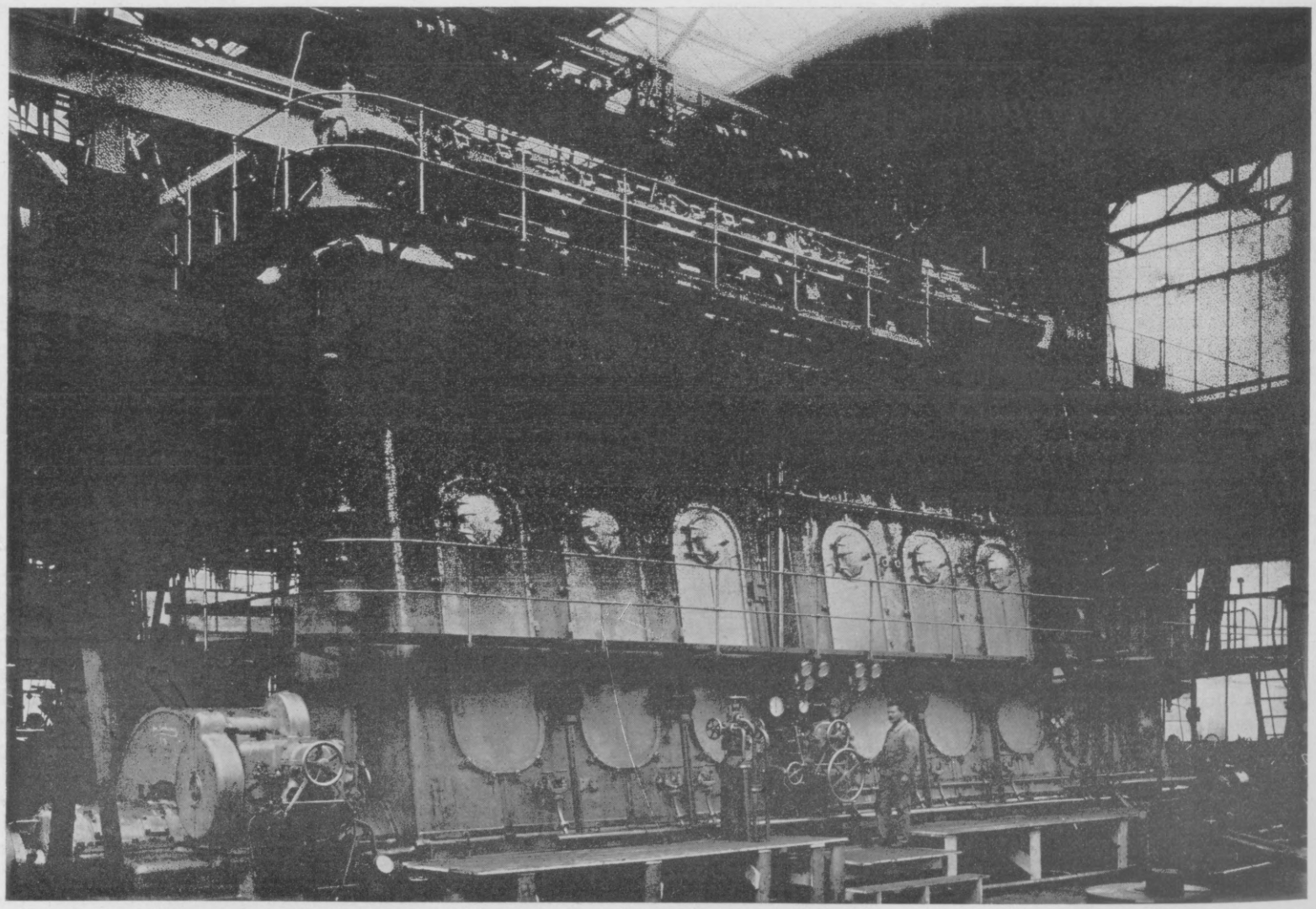
	New Orders	*Launchings*
Great Britain and Ireland	252,625 tons	358,323 tons
Other countries	278,208 "	194,268 "
World total	530,833 tons	552,591 tons

In the previous quarter Great Britain and Ireland, as well as the other countries, began more new shipping than they launched. The standing of the various shipbuilding countries now, compared with the June quarter is shown in the following table of gross tonnage ordered, says Lloyd's Register:

TONNAGE BUILDING IN VARIOUS COUNTRIES

	Sept. 30,1924	*June* 30,1924
Great Britain and Ireland	1,468,408 tons	1,516,746 tons
Germany and Danzig	408,617 "	340,749 "
France	137,210 "	144,240 "
Italy	132,457 "	127,772 "
Holland	88,643 "	96,453 "
United States	64,905 "	103,665 "
Japan	50,059 "	66,654 "
British Dominions ..	34,778 "	34,925 "

Great Britain and Ireland are now building slightly less than 57 per cent of the world's total, compared with 57 per cent at June 30; the United States, which in June had about 4 per cent of the total is now constructing only about two and one-half per cent, while the other maritime nations' share has risen from 32 per cent to about 40.5 per cent. Germany and Danzig now have about 16 per cent of the world total.



For the world's largeset single-screw conversion: the 3,600 shaft h p. at 90 r.p.m. Sulzer Diesel unit on the erecting floor in the shops at Winterthur prior to installation in the Dutch steamer "Bintang" now being converted from steam to oil-engine power. Lloyd's records quoted above, while covering new motorship construction, do not include vessels being converted from steam to Diesel. The length of this big engine is 51 feet without thrust bearing

Twelve Bidders for Board's First Twelve Conversions

ACTIVE competition displayed itself when bids on the Diesel engines for the first twelve ships to be converted by the Shipping Board were opened in New York on October 14th. The bidders included the country's foremost oil-engine manufacturers as well as several ship builders and engineering concerns who have recently taken up the construction of oil-engines either from their own design or under foreign license. The latest forms of Diesel design and construction were incorporated in the various bids, and the Board thus is given an opportunity of equipping its vessels with a type of machinery that will not be rendered obsolete by any invention yet on the horizon.

It is a most significant fact that four firms offered double-acting Diesel engines, indicating the growth of this tendency in many quarters. Three companies proposed single-acting two-cycle Diesel engines; one firm offered medium-speed four-cycle Diesel engines in conjunction with reduction gears; another company offered two-cycle opposed-piston airless-injection engines. The remaining bidders offered single-acting slow-speed four-cycle Diesel engines.

The tests according to the Board's specifications are as follows:—

"The first engine shall be tested at the builder's works at overspeed, overload, rated and fractional loads, with powers varying approximately as the cube of the engine speed, as follows:—

Single-acting Two-cycle, Single-acting Four-cycle, Double-acting Two-cycle, Double-acting Four-cycle, Opposed-piston Diesel Engines and Reduction-geared Drive are Represented in Competitive Bids

(a) 2 hours at ¼ power.
(b) 4 hours at ½ power.
(c) 6 hours at ¾ power.
(d) 30 days' non-stop run at rated power and R. P. M.
(e) 6 hours at rated R. P. M. and M. I. P. 10% greater than normal.
(f) 4 hours at 10% greater M. I. P., and 5% higher R. P. M. than normal.
(g) 1 hour in astern direction at full load and R. P. M.
(h) 1 hour, starting, stopping and reversing.
(i) Slowest speed at which engine can operate continuously; also acceleration and over-speed test to check governor setting.

Each succeeding engine shall be tested in builder's shop as follows:—

24 hours non-stop run at rated power and R. P. M.
6 hours at 10% greater M. I. P., and 5% greater R. P. M. than normal.
1 hour continuous astern test at full load and R. P. M.
I hour starting, stopping, reversing, slow and over-speed tests.

The Board in its contract specifications stipulated that the engines shall be conservatively rated with the idea of ensuring maintenance of the rated shaft horsepower at the rated revolutions under normal service conditions. Another stipulation is that under such rating conditions the piston speed shall not exceed about 900 ft. per minute, while the mean indicated-pressure (referring to i. h. p.) shall not exceed 90 pounds per square inch for four-cycle engines, and 85 pounds per square inch in the case of two-cycle engines.

It is anticipated that orders will be placed by about the time that this appears in print. There is some possibility of the Board increasing the number of ships to be converted at this time, a proposal which cannot be urged too strongly as nothing in an engineering way can be gained by waiting, and there should be no difficulty in finding services or buyers for at least two dozen up-to-date motorships by the time they are ready, which will be fifteen to eighteen months. There also is a possibility of all the bids being thrown out. However, up to the time of closing for press no definite decision appears to have been reached by the Board. The Board is empowered to convert about 50 vessels—or any number up to the cost of $25,000,000.

Orders for the auxiliary oil-engines and auxiliary equipment are to be placed separately and bids will shortly be called for. It will probably be six or more months before bids are asked on the work of converting hulls.

RESUME' OF PROPOSALS - MARINE OIL ENGINES:

BIDDER:	PRICE: 1 engine	2 engines	3 engines	4 engines	SHOP TESTS:	DELIVERY: 1 engine	2 engines	3 engines	4 engines	TYPE:	NO. OF CYLINDERS	HORSE-POWER:	RPM:	
Bethlehem SB Corp:														
Proposal #1:	278,500	529,000	735,000	968,000	If all shop tests re-	10 mos.	12 mos.	14 mos.	16 mos.	Beth. 2-cyc., single-				
" #2:	279,600	531,200	738,300	972,400	quired, will increase	10 "	12 "	14 "	16 "	acting, vertical, with				
" #3:	338,500	645,000	892,800	1,181,400	bids: 1 eng., $90.000	12 "	14 "	16 "	18 "	attached scav'g. pumps.	6 - 26" x 48"	2225	95	
					2 engs., $97,000.,					Beth. 2-cyc., single-				
					3 engs., $102,000.,					acting, vert., with in-				
					4 engs., $105,000.					dependent scav. blowers:	6 - 26" x 48"	2400	93	
										Beth. 2-cyc., single-				
										acting, vert., with at-				
										tached scavenging pumps	6 - 27" x 60"	2700	85	
Busch-Sulzer Bro.	339,700	605,000	856,000	275,000	Will reimburse $16,000	14 "	16 "	18 "	and one	Busch-Sulzer, 2-cycle,				
				ea. in ex-	if shop tests omitted.				every 2 months.	vertical, single-acting.	6 - 30" x 52"	3000	90	
				cess of 3.										
Wm. Cramp & Sons Sh.& Eng.Bldg.Co.	320,000	614,000	896,000	1,171,000	Not included:	10 "	And one every six weeks			4-cycle, single-acting. "Burmeister and Wain"	8 - 29-1/8 x 59"	2500	90	
Falk Company:														
Proposal #1:	169,000	322,000	477,000	628,000	Will reimburse $900. if	240 days and one every 45 days.				4-cycle, single-acting,				
" #2:	232,000	-	-	-	shop tests omitted.	460 "				geared marine engine	12 - 20" x 28"	2400	75	
										4-cycle, single-acting,				
					(Includes shop tests-					geared marine engine	12 - 24" x 28"	3000	75	
Hoover-Owens-	-	534,500	-	-	(Will reimb. $5000. for	15 mos.	18 mos.			Hamilton M.A.N. double-	4 - 27.55" x			
Rentschler Co.					(first eng. if tests omitted:					acting two-cycle	43.30"	3050	95	
McIntosh & Seymour:					Will reimb. $11,250. for									
Proposal #1:	290,900	561,925	837,450	1,094,975	first eng.if tests omitted.	10 mo. and one every 45 days.				Vert.,4-cyc.,single-act.	6 - 32" x 60"	2600	95	
" #2:	266,086	512,422	763,588	995,494	Will reimb. $10,500. for	" " " "	" "			" " " "	6 - 32" x 60"	2350	95	
					first engine.									
" #3:	377,780	730,475	1,088,970	1,424,265	Will reimb. $13,950.for 1st eng.	10 mo.	" "	" "		" " " "	8 - 32" x 60"	3450	95	
" #4:	259,600	498,980	742,960	968,540	Will reimb. $11,400.for 1st eng.	10 "	" "	" "		" " " "	4 - 32" x 52"	2700	95	
Subtract $12,500. each engine on Proposals #1 and #3 for detached compressor														
New London S.& E. Co.														
Proposal #1:	210,000	410,000	606,000	808,000	Without shop tests:	15 mos.	17-2/3 mos.	20-1/3 mo.	23 mo.	2-cycle, double-acting:	4 - 27.55"x43.30"	3000	95	
" #2:	222,000	424,000	627,000	828,000	With shop tests as speci-	15-1/3 m.	18-1/3 "	21-1/3 mo.	24-1/3 mo.	" " " "	" " " "	"	"	
" #3:	230,000	432,000	634,500	836,000	fied by New London.	16 mos.	19 "	22 mo.	25 mo.	" " " "	" " " "	"	"	
" #4:	275.000	479 000	682,500	890,000	" " " "	16½ "	19½ "	22½ "	25½ "	" " " "	" " " "	"	"	
Nordberg Mfg.Co:	350,000	580,000	810,000	1,057,000	Incl. shop tests; will	11 mo. and every 2½ to 3 mos.				Nordberg, vert.,2-cyc.,	6 - 29" x 54"	3000	90	
					reimb. $66,500 if tests omitted	thereafter.				single-acting.				
New York SB Corp:	205,000	410,000	($20,000. additional on 1st and $12,000. on 2nd if tests required)			12 mo.	14 mos.			Werkspoor,vert.,4-cyc., single-acting	8 - 29" x 59"	2432	90	
Pacific Diesel Eng.Co:					Will reimb. $7,000. if							2400	95	Detached, compressor.
Proposal #1:	192,500	367,000	529,500	706,000	shop tests omitted.	240 days and every 40 days thereafter				Werkspoor,vert.,4-cyc.,	8 - 28¾"x51-3/16"	2150	95	Attached compressor.
" #2:	205,500	393,000	561,000	748,000	Will reimb. $8,000. if	240 " " "	40 " "			" single-acting W "	8 - 31½"x51-3/16"	2900	95	Detached compressor.
For detached compressor add $17,500 each engine to Proposal #1 and $23,500 each engine to Proposal #2					shop tests omitted.							2585	95	Attached compressor.
Sun S. B. Co.					Plus $15,000. for each engine if					Sun-Doxford opposed pis-				
Proposal #1:	195,000 each for four engines				shop tests required.	7 mos. and one each month thereafter.				ton, two-cycle:	4 - 22.83"x91.34"	2500	90	
" #2:	225,000 " " " "				" " " "	7 " " " "	" "			" " " "	4 - 23.62"x91.34"	3000	90	
Worthington Pump and Machinery Corp.	243,224	440,214	625,661	799,928	Will reimb. $19,500. if shop tests omitted.	9 mos.	10 mos.	12 mos.	13 mos.	2-cycle, double-acting:	4 - 28" x 40"	2900	95	

NOTE: THE ABOVE FIGURES DO NOT TAKE INTO ACCOUNT SUCH MISCELLANEOUS EXTRAS AS SPECIAL EQUIPMENT, SPARES, GUARANTEE ENGINEERS, ETC.

The above is a facsimile of the Shipping Board's résumé on the bids of marine oil-engines for propelling the first twelve ships to be converted by the Board under their new program. The fourth engine offered by McIntosh & Seymour is a double-acting unit and not single-acting as quoted

"Trojan" pushing six coal laden barges along Pittsburgh's riverfront, where oil engines are making good in the face of the cheapest kind of competition from coal-generated steam power

Motor Craft on America's Great Rivers

Stern Paddle-wheel Tow Boat "Trojan" Demonstrates Her Economy and Reliability in Service

By J. G. Oetzel

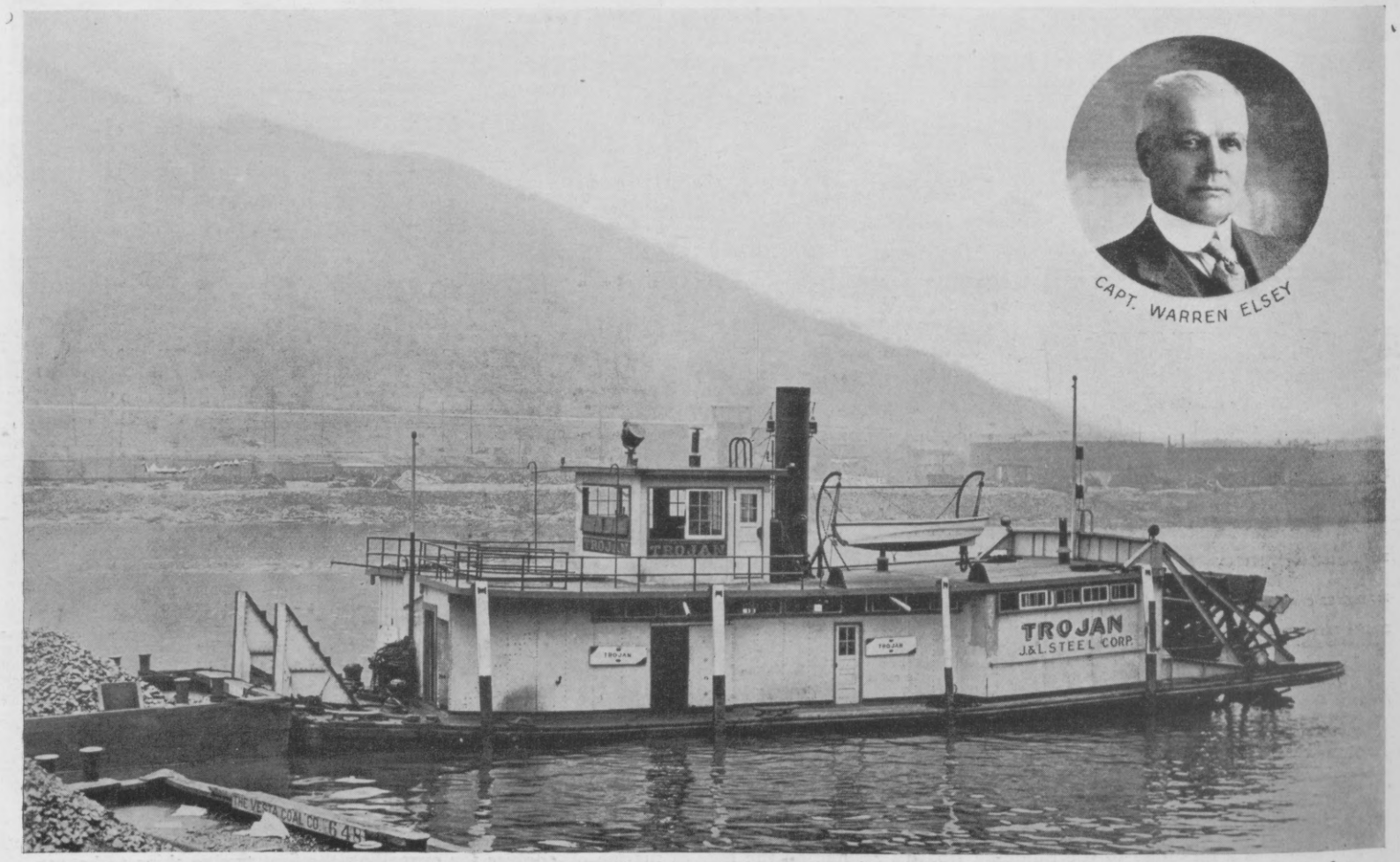
RAPID development of the United States has been due largely to the development of transportation. Before the days of the railroad, the Mississippi River and its tributaries conveyed most of the commerce of the Middle West, and it was along this natural transportation system that our settlement progressed most rapidly. With the development of the railroads, commerce left the rivers for the faster transportation by rail. During the World War, the railroads became so congested that our great natural transportation system was turned to for relief.

Since the war, interest in river transportation has been increasing on account of high freight rates by rail. Now that the cost of power has become a determining factor, the oil-engine has gained in importance, on account of its low fuel consumption and the decreased attendance required. The stern paddle-wheel is symbolic of our Middle Western Rivers, and while to some it may appear crude, its practicability has been demonstrated through years of service. One of the most formidable problems confronting the application of the oil engine to stern-wheel drive is the transmission of power from engine to wheel.

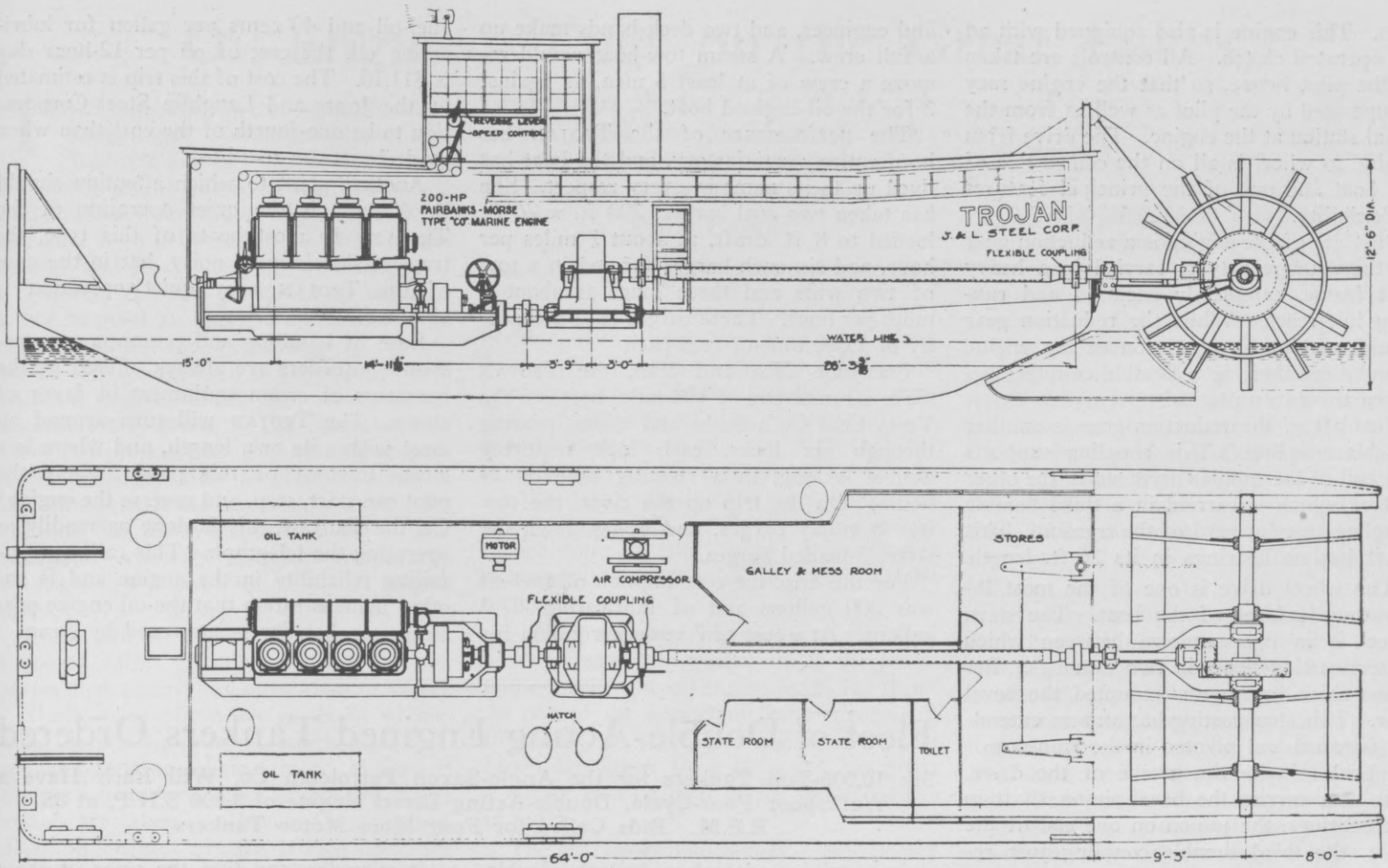
In a recent issue, the Harvey was quoted as being the first direct-driven reversing oil-engined stern-wheeler, but according to records, the first stern-wheel river boat to use a direct reversing oil-engine was the W. C. Kelly, of the Kelly Axe Co., which was equipped with a 200 h.p. Fairbanks-Morse engine and was put in service in May, 1923. The second direct-reversing oil-engine driven stern-wheel tow-boat was the Trojan, which was put in service by the Jones and Laughlin Steel Corporation in September, 1923.

The Trojan was designed in the Engineering Department of the Jones and Laughlin Steel Corporation under supervision of Capt. Warren Elsey, Master of River Transportation, and built by the Marietta Mfg. Co., at Point Pleasant, W. Va. The Fairbanks-Morse & Co. supplied the engine and co-operated with the Steel Corporation in its application to this service, working out pilot house control, etc.

This boat embodies some features of con-



The Jones & Laughlin Steel Corporation's stern wheel oil-engined tow-boat "Trojan" in the Pittsburgh locality. Inset shows her skipper



Inboard profile and plan of the "Trojan," showing the oil-engine drive through the reduction-gear to the stern wheel. The three flexible-couplings make it possible to throw the wheel-shaft several inches out of line with the engine-shaft without injuring the gear-reduction machinery and oil engine

siderable interest. As she was designed to be used principally in the Pittsburgh Harbor, her length was held at a minimum, in order to facilitate maneuvring in a restricted space. Her principal dimensions are as follows:

Length on deck	64′—0″
Length over all	82′—0″
Breadth, moulded	22′—0″
Depth, moulded	5′—0″
Draft	3′—9″
Outside diam. stern wheel	12′—6″
Length of wheel (each section)	8′—0″
Space between sections of wheel	1′—6″
Number of buckets	12
Radial Width of bucket	1′—6″
R. P. M. of wheel	22

The boat is constructed of steel throughout, the hull being heavily plated and well trussed to withstand the severe service to which it is subjected, and is divided into six water-tight compartments. There are two balanced rudders, each 13′—6″ long, having a combined area of 150 sq. ft. The engine-room occupies a space of about 28 ft. long.

The machinery is located forward, as is usual with this type of boat, and consists of the following:

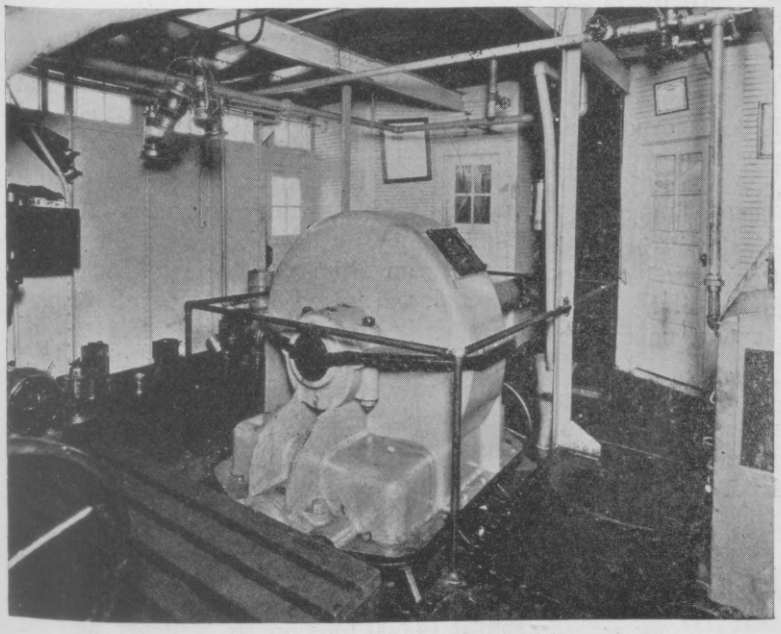
Main Engine:

Fairbanks-Morse type "C O" two-cycle
Horsepower 200
Number of cylinders 4
R. P. M. 250

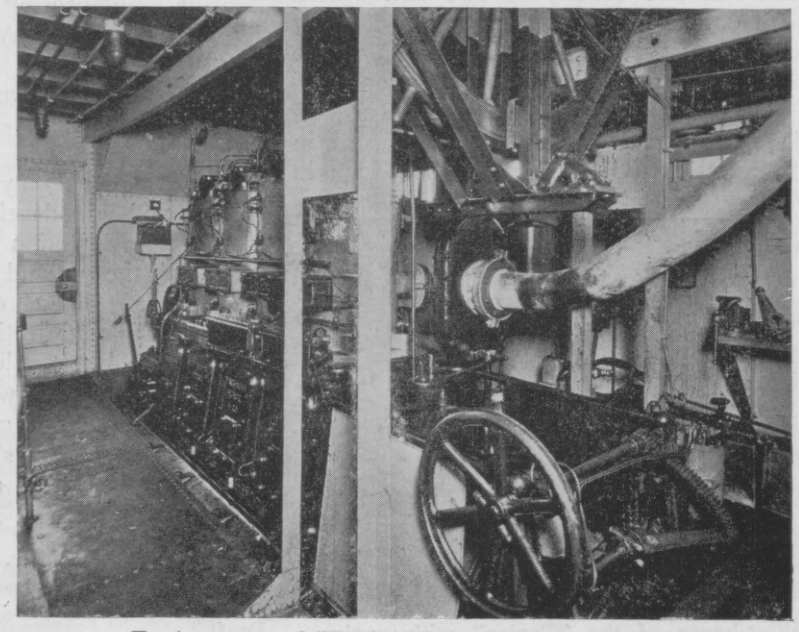
Auxiliary Machinery:

1—Air-Compressor, electric-motor driven
1—Air-Compressor, gasoline-engined
1—Bilge pump, electric-motor driven
1—5 K. W. Electric Generating set, gasoline-engine driven

The main engine is also equipped with an air compressor, and it is seldom necessary to start one of the auxiliary compres-



Spur type reduction gear in the "Trojan's" engine-room



Engine-room of "Trojan" has pilot-house control

sors. This engine is also equipped with an air operated clutch. All controls are taken to the pilot house, so that the engine may be operated by the pilot as well as from the usual station at the engine. The drive from engine to wheel is all on the center line of the boat and one of the principal features is flexibility.

Just aft of the engine is a reduction gear of the spur-gear type, carried in a heavy cast frame, completely enclosed and running in grease. While the reduction gear is mounted on an extension of the engine foundation, there is a flexible coupling between the two units.

Just aft of the reduction gear is another flexible coupling. This coupling supports one end of the tubular drive shaft, the other end of which is carried in a third flexible coupling just forward of the transom. This shaft has no bearings in its 26-ft. length.

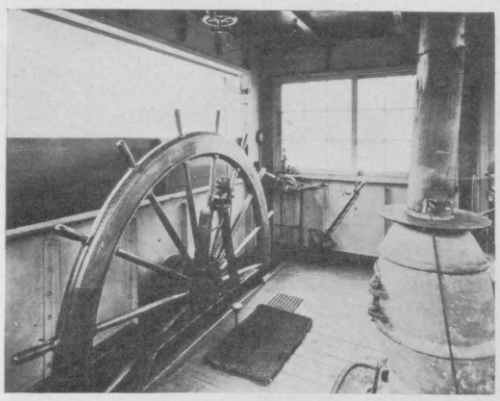
The wheel drive is one of the most interesting features of the boat. The stern wheel is in two sections, between which a steel casting floats in two bearings. Between these bearings is mounted the bevel gear. This steel casting has an arm extending forward and pivoted in the transom of the boat to take the torque of the drive. This arm carries the bevel-pinion shaft in two bearings, the pinion on one end of the shaft, the third flexible coupling just referred to being on the other.

The thrust of the bevel-gear and pinion are thus taken up entirely within this steel casting, the gears are perfectly meshed, completely enclosed, and run in grease.

With this flexible drive, it would be possible to throw the wheel-shaft 3 or 4 inches out of line with the engine-shaft without in any way injuring the driving mechanism. From this it is seen that weaving of the hull due to grounding on one corner, or any distortion which may be occasioned by blows of the fan tail or wheel-beams against dock walls or barges or by the wheel striking floating logs or ice, will not cause any trouble due to misalignment.

Owing to the small size of the boat, the crew's quarters are somewhat restricted. The quarters consist of two state-rooms with double bunks, and a combined galley and mess room. Stores, supplies, spare parts, etc., are carried in the tiller-room.

The small crew's quarters are not a handicap, however, since all the controls are in the pilot-house. The pilot is both captain and engineer, and two deck-hands make up a full crew. A steam tow-boat would require a crew of at least 5 men, as against 3 for the oil-engined boat.



Pilot-house of the "Trojan" with engine control lever on starboard side

The performance of the TROJAN has been entirely satisfactory, and the boat has lived up to its name in every respect. She has taken two coal barges, 200 ft. x 26 ft. loaded to 8 ft. draft, at about 7 miles per hour, and six such barges formed in a tow of two wide and three long, at about 3 miles per hour. These barges have a capacity of 1,000 tons of coal each.

On June 28th and 30th, the TROJAN made a round trip of 108 miles between the Vesta Coal Co.'s docks and mines, passing through six locks, each lock requiring double locking, in a running time of 24 hours. On the trip up the river, the tow was 6 empty barges, and going down the river, 3 loaded barges.

For this trip, the consumption of fuel-oil was 300 gallons and of lubricating-oil, 3 gallons. At a cost of 7 cents per gallon for fuel-oil and 40 cents per gallon for lubricating oil, the cost of oil per 12-hour day is $11.10. The cost of this trip is estimated by the Jones and Laughlin Steel Corporation to be one-fourth of the cost than when made by steam tow-boat.

Another point to which attention should be directed is the quiet operation of the TROJAN. In most boats of this type, the transmission is quite noisy, but in the case of the TROJAN very quiet operation is obtained.

Ease of handling and promptness in response to orders are always offered by the operators of steam equipment in favor of steam. The TROJAN will turn around almost within its own length, and where is a steam towboat of this power where the pilot can start, stop, and reverse the engine? On the TROJAN, this is done as readily as operating the telegraph. This calls for unfailing reliability in the engine and is another demonstration that the oil engine possesses a reliability unsurpassed by steam.

Fleet of Double-Acting Engined Tankers Ordered

Six 10,000-Ton Tankers for the Anglo-Saxon Petroleum Co. Will Each Have a Werkspoor Four-Cycle, Double-Acting Diesel Engine of 3,600 S.H.P. at 85 R.P.M. Bids Called for Four More Motor Tankers

As a striking example of how the double-acting Diesel engine is today attaining a most important position in maritime affairs is shown by the announcement that an order has been placed by the Anglo-Saxon Petroleum Company of London for six large single-screw motor tankers, to cost in aggregate $5,850,000, each of which will be equipped with high-powered Werkspoor double-acting Diesels of 3,600 s.h.p. at about 85 r.p.m. Bids have just been called for four more motor tankers at a cost of about $4,500,000.

The order has gone to Werkspoor of Amsterdam, and these engines will be substantially of the same *four-cycle* double-acting design as the one which has been built and tested at the plant of their British licensees, the North Eastern Marine Engineering Co., Wallsend-on-Tyne, jointly with Werkspoor of Amsterdam. Furthermore, certain modifications suggested by C. Zulver, marine superintendent of the owners, will be incorporated.

Each engine will have six cylinders, 820 mm. (32.28″) by 1,500 mm. (59.05″) stroke, and will develop 3,600 s.h.p. at 85 r.p.m. Air injection of fuel will be used with both the top and bottom cylinders, but the auxiliary Diesel engines will be fitted with an airless-injection apparatus of the Werkspoor-Arschaouloff system.

The new tankers will be of 10,000 tons d.w. each and will be constructed with vertical framing on the sides and longitudinal framing on the deck and bottom. Overall dimensions are:

Length, b.p.	440′
Breadth, md.	59′
Depth, md.	32′ 9″
Draft	25′ 3″
Speed	12½ knots

It is understood that the price of these vessels is $50,000 per ship less than the lowest British quotation, although the contract stipulates that British materials are to be used in their construction. Three of the ships are to be built by the Netherlands Shipbuilding Co. of Amsterdam, and three by the Rotterdam Dry Dock Co., Rotterdam. Cabled advices say that two of the engines will be built by the British licensees of Werkspoor, namely the North Eastern Marine Engineering Co., Ltd., and one will be built by the Rotterdam Dry Dock Co., but no reference has been made to this in the notification from Werkspoor.

The Anglo-Saxon Petroleum Company is the oil-carrying subsidiary for the Shell Transport and Trading Company and Royal Dutch Petroleum Company combine.

Maiden Voyage of British Aviator

Being the first vessel to have a single-screw Fullagar two-cycle, opposed-piston type Diesel engine of 3,000 s.h.p. (see pages 662 and 666 September, 1924) the maiden voyage of the BRITISH AVIATOR to Abadan should be of no little interest. On a continuous run from the Tyne to Port Said the engine averaged 3,115 i.h.p. at 74 r.p.m. on a daily consumption of 9.02 tons of Anglo-Persian 18,900 b.u.t. fuel-oil, which by the way, was run through a De Laval centrifugal purifier before injecting. "This consumption," states the report, "works out at 0.28 lb. per i.h.p. hour. The average speed of the ship was 11.31 knots, which is most excellent considering a displacement on the voyage of 10,049 tons on a draft of 18′9″. Fully loaded the displacement of the ship it 14,600 tons on 26′ 5″ draft, and the speed about 11 knots at full power.

Oil-Engined Tugs on the Great Lakes

Great Lakes Dredge & Dry Dock Company Takes Over the MARCY C. *and* MARTHA C. *Built at Manitowoc and Powered With Fairbanks Morse Engines*

TWO tugboats powered with 300-s.h.p. six-cylinder Fairbanks Morse surface-ignition oil engines have been completed at the yards of the Manitowoc Shipbuilding Company of Manitowoc, Wis., and have been delivered to the Great Lakes Dredge and Dock Company of Chicago.

Whereas the fuel consumed by tugboats is not as great an expense as that of large cargo vessels, the percentage of saving which can be achieved by equipping them with oil engine rather than steam power is considerably greater. The fact, also, that their consumption as coal-burning vessels is not proportionately as great as some of the other cost items involved in towing operations has made it possible for a considerable number of operators temporarily to neglect the possibilities of oil engine drive.

From another point of view, however, tugboats offer greater opportunities for saving than almost any other class of vessel.

Their steam plants are generally of medium or small power, of which high fuel-consumptions are characteristic, at least if the performance of steam engines of larger vessels are taken as a basis of comparison. That oil engines greatly reduce operating expenses when they are substituted for the larger and relatively more economical steam engines is a demonstrated fact. In competition with steam tug machinery using four or five pounds of coal per h.p.-hr. and burdened with a heavy standby consumption they are able to effect correspondingly greater savings. Only the fact that the small steam tugboat does not eat up as large a coal pile as vessels of a more substantial size is responsible for the somewhat slower recognition of the large proportionate economies made possible by means of the oil engine.

Signs are multiplying, however, that tugboat operators are waking up to the possibilities which the oil engine holds for them. As one of the important firms engaged in this work on the Great Lakes, the Great Lakes Dredge & Dock Company has given a strong endorsement to the modern form of drive.

The two boats which they have ordered are built entirely of steel to the following dimensions.

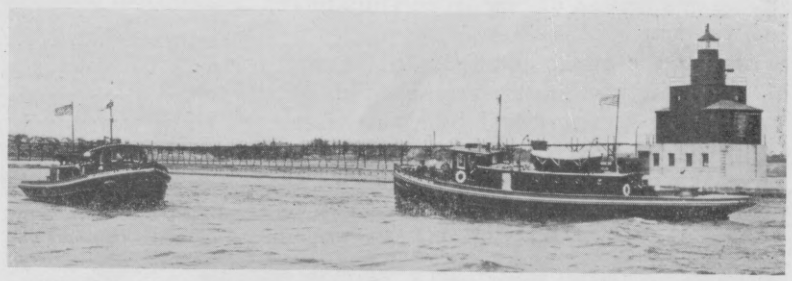
Length on deck	85 ft. 0 in.
Beam, moulded	21 " 0 "
Depth, moulded	11 " 0 "
Draft	9 " 9 "

They are identical in every respect and have been christened MARY C. and MARTHA C., in honor of the twin daughters of President J. F. Cushing, of the Great Lakes Dredge and Dock Company.

Characteristic of the Fairbanks Morse engines which have been installed are extreme simplicity, the use of low working pressure and the absence of injection air for the introduction of fuel into the cylinders. They are direct-connected to the propeller shaft, no clutch or reverse gear being used. All maneuvers are simply and positively carried out by the use of compressed air.

All electric auxiliaries are fitted on these tugs, both the steering engine and towing winch being electrically operated. In view of the fact that isolated instances of steam auxiliaries being used on large cargo vessels are still met with, the use of electricity on these most modern tugs is especially significant. It is practically a foregone conclusion that their operation will be a duplicate of the notable achievements already made by boats of this kind with similar equipment.

One of the surface-ignition engined tugs recently delivered to the Great Lakes Dredge & Dock Co., Chicago



Oil-engined tugs demonstrate maneuvering ability in front of Manitowoc, Wis., pier-head

New London Ship & Engine Company to Build Ships

For the purpose of going into steel hull construction within the next few months the New London Ship & Engine Company is extending its plant. The extensions consist of one fireproof building, 200 x 60 feet, one overhead crane structure, 105 x 350 feet, together with the tool equipment, etc.

The company is prepared to build steel hulls of any size or any type up to 300 feet length, and they will be in a position to start work along these lines about the first of the year. Evidently this firm is confident that at least there will be a considerable amount of work in all types of coastwise motor craft, aside from a certain amount of medium-sized oceangoing shipping, and will be fully prepared to adequately handle work of this nature.

In view of the capacity of the Diesel plant of the New London Ship & Engine Company it should be in a particularly advantageous position to construct new motorships as well as to convert existing steamers.

Conversion of American Tanker Anahuac

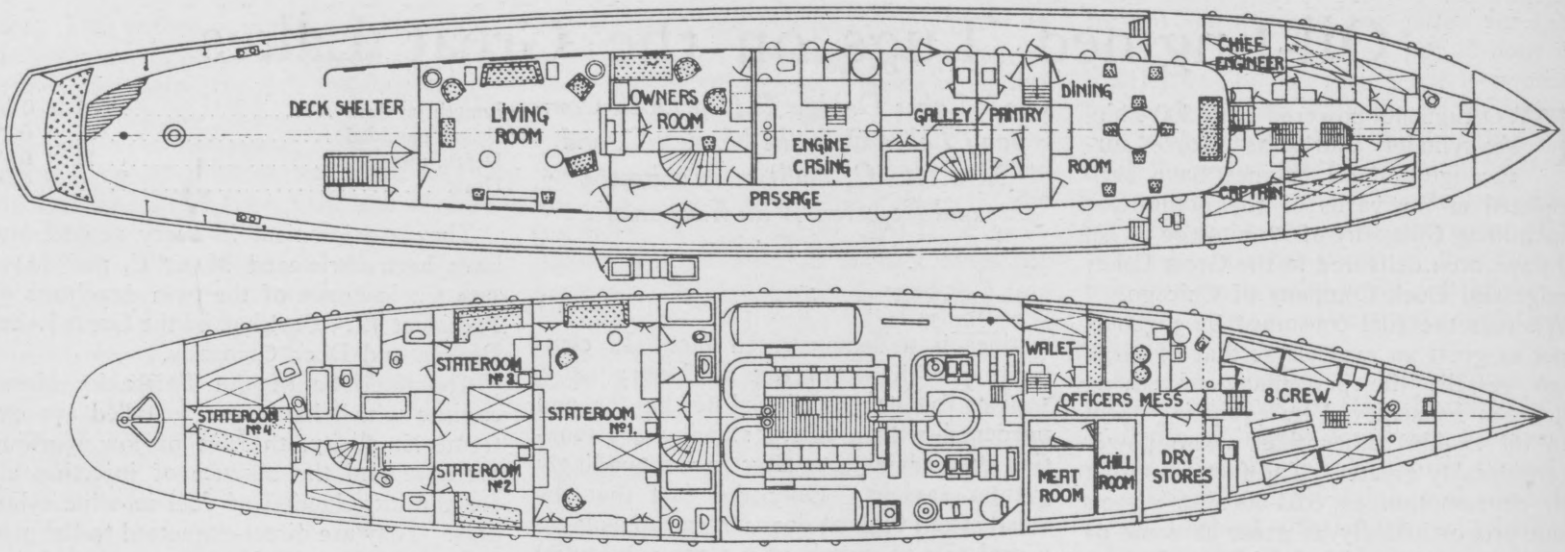
Reference has previously been made in MOTORSHIP to the forthcoming conversion of the steam-driven tanker ANAHUAC of the Atlantic Refining Company's fleet to Diesel-electric power. The contract for the conversion work has been placed with the Bethlehem Shipbuilding Corporation and will be carried out at their Harlem Plant, Wilmington, Del.

The ANAHUAC has an overall length of 180 ft., breadth 31 ft., molded depth of 17 ft., and a capacity of approximately 10,000 barrels. The new propelling machinery will consist of two 225 b.h.p. Ingersoll-Rand airless-injection oil-engines direct-connected to 155 kilowatt 125-volt generators. Both the generators and the single 250-volt propelling motor, which is rated at 375 shaft horsepower at 120 r.p.m., will be furnished by the General Electric Company. This propelling equipment is similar to that installed in the VAN DYKE tugs I, II and III, recently placed in service.

The oil-engines being installed in the ANAHUAC are of the same type as the three 840 b.h.p. Ingersoll-Rand oil-engines purchased by the Atlantic Refining Company for installation in the Shipping Board tanker ALLENTOWN, which is being renamed the J. W. VAN DYKE. The latter will have Westinghouse drive and not General Electric equipment as stated in our Conversion Supplement, in which the engines were also quoted as being of 750 b.h.p. When the work of converting both the tanker ANAHUAC and the tanker J. W. VAN DYKE is completed, the Atlantic Refining Company will have a fleet of five oil-engined electric-driven vessels.

Wooden Steamer Converted

Conversion of the wooden steamship PATTERSON has been completed by the Todd Dry Docks, Inc., Seattle, to the order of the Oregon Motorship Corporation, Portland, Ore. A 320 b.h.p. Bolinder oil-engine from the auxiliary MOONLITE has been installed.



Accommodation plans of the motor yacht "Vedette"

Diesel Yachts on Increase—"Vedette" and "Oceanus"

Only the Use of Diesel Propelling Power Makes It Possible to Accomplish the Utmost in Yacht Design and Construction

AS one of the most important factors in the design of the highest class of yachts and luxury vessels, the Diesel engine is constantly gaining favor with naval architects and with the millionaire clients for whom they design these boats. The fact that Diesel engines would not be chosen for this work simply because of the cheapness of their operation strongly emphasizes the reliability, cleanliness, instantaneous availability and many other desirable qualities as distinguished from mere fuel economy.

Among the latest additions to the fleet of super-luxury boats are Fred'k. W. Vanderbilt's VEDETTE and John W. Kiser's OCEANUS, both of them designed by Cox & Stevens, of New York, and propelled by twin Diesel engines. Nothing has been spared to make these vessels the last word in yacht construction so far as their fitting-out with de luxe furnishings and their equipment with the most modern machinery is concerned.

Principal dimensions of the VEDETTE are:

Length over all	158 ft. 6 in.
Length on water line	148 " 0 "
Beam	26 " 0 "
Draft	11 " 3 "
Power	1,000 s.h.p.

Her stem is practically vertical and she has a flush deck with a continuous sheer and high bulwarks. Quarters for the owner and his guests are on the berth deck aft and consist of five large staterooms each with a separate bath.

Placed amidships in a compartment provided for the purpose are two Burmeister & Wain Diesel engines of 500 s.h.p. each, which give the VEDETTE a speed of 14½ knots. Since the Burmeister & Wain Company, of Copenhagen, Denmark, are also the builders of the hull, they have no doubt had an opportunity to install their machinery with special reference to its requirements. The VEDETTE has been referred to as a very sensible type of craft which is bound to be popular among yachtsmen, as it combines many qualities obtainable only as the result of using Diesel engines.

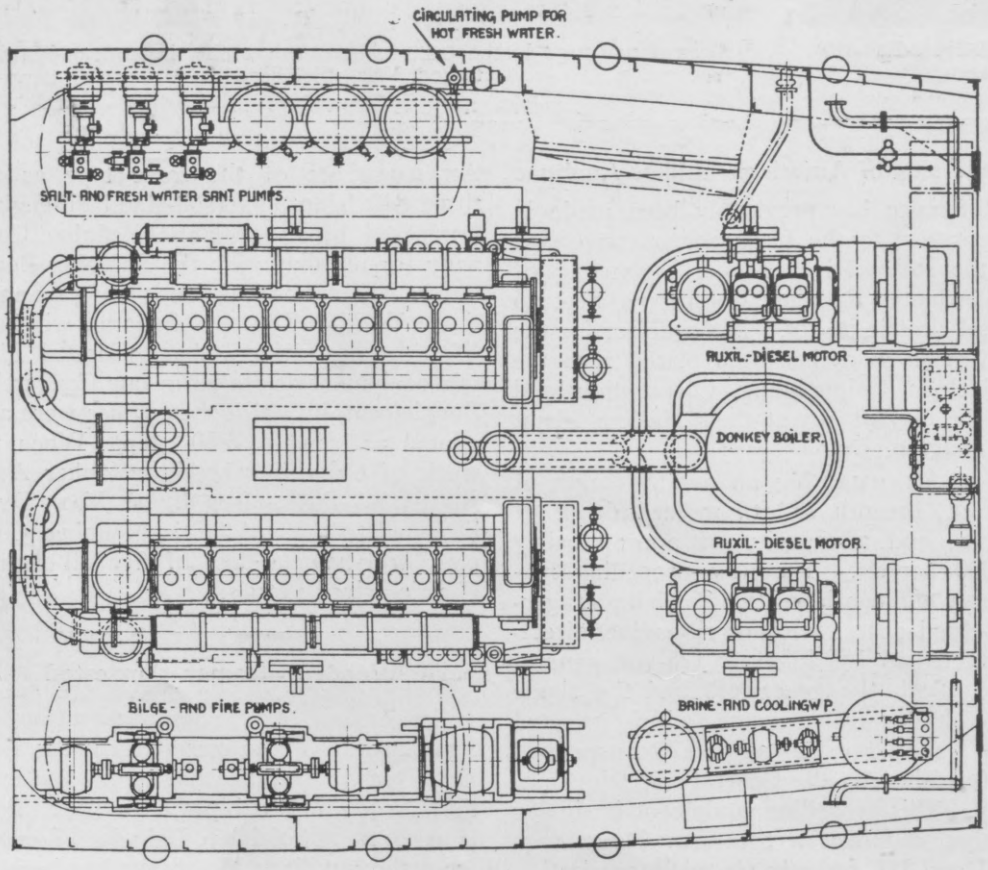
Also designed by Cox & Stevens, the cruising yacht OCEANUS was built under their supervision by the Fried. Krupp Germaniawerft at Kiel-Gaarden, Germany. After completing a fast voyage across the Atlantic, in the course of which she proved herself to be an excellent sea-boat, she was immediately placed in commission by her owner and has been in constant use by him.

The OCEANUS has a pleasing appearance, with a good-looking sheer, straight stem, and elliptical stern. Her accommodations are regarded as being unusually good and she is said to be in every way typical of the advance in yacht design made possible by the use of Diesel engines as propelling power. Hull dimensions are as follows:

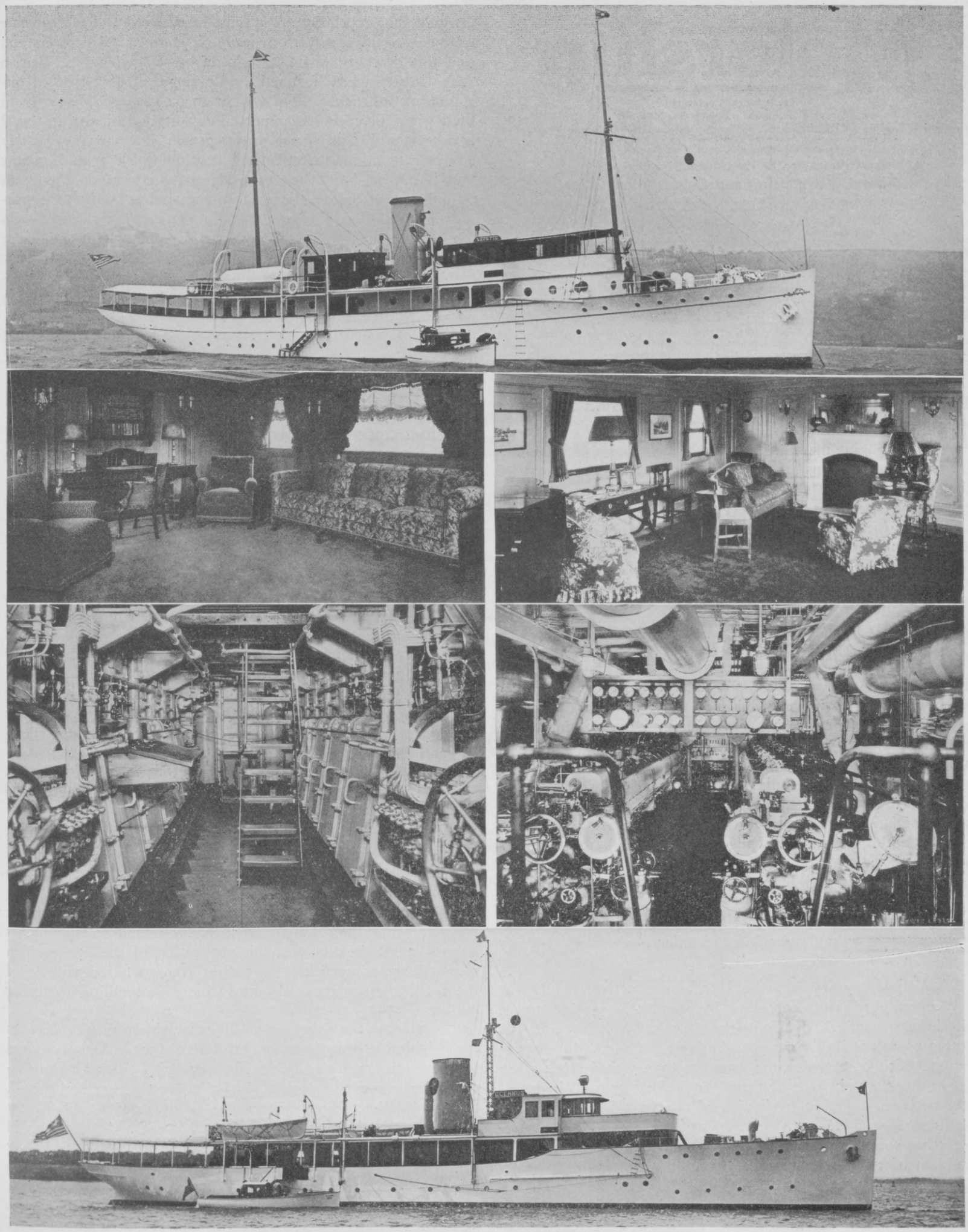
Length over all	156 ft. 4 in.
Length on water line	149 " 2 "
Beam	24 " 6 "
Draft	9 " 6 "
Power	700 s.h.p.

Owners' and guests' quarters are on the berth deck aft and consist of five large and well-arranged staterooms, each communicating with bath rooms.

The propelling units consist of two Krupp Diesel engines of 350 s.h.p. each, and they give the vessel a fair turn of speed, and the cruising radius is in excess of 5,000 miles.



Engine-room plan of the motor yacht "Vedette"



Two Luxurious Foreign-Built Yachts for American Owners

Top, "Vedette," a Diesel-driven yacht just built in Denmark to the order of Frederick W. Vanderbilt of New York. Below on left, luxurious living-room of the "Vedette" and underneath the living-room can be seen her engine-room showing the twin Burmeister & Wain propelling units. Below again is the new motor yacht "Oceanus" built in Germany for John W. Kiser of New York. Upper right is the living-room of the "Oceanus" and directly below are illustrated her two Diesel engines

Motorship

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THOS. ORCHARD LISLE.....Editor
A.M.S. Naval Engineers. A.M.I. Marine Engineers.
RUSSELL PALMER .....Manager

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Diesel Engines and the Board's Conversion Program

ELSEWHERE in this issue are listed the bids of the various Diesel engine manufacturers and shipbuilders of the country who are desirous of participating in the initial part of the Shipping Board's steamship conversion program, which consists of twelve vessels. There are no fewer than 12 bidders.

A study of the bids will show that the engines offered incorporate the latest domestic and European designs and that there is nothing on the horizon calculated to render them obsolete for a good many years to come. Thus the Board has been offered facilities for producing vessels of the most modern type, some of which may even be considered in a strict engineering sense to be advanced experiments.

MOTORSHIP has recommended to the Board that the immediate program be increased from 12 to 24 ships, awarding whatever possible and advisable not less than two engines to each successful contractor. This action should stimulate the industry and will permit manufacturers to effect economies of production

As we write the Technical Department of the Emergency Fleet Corp. is making a careful analysis of all the bids submitted and the same was due to be laid before the Board on October 28th. This issue of the magazine will be on the press prior to any awards or decision being made by the Board.

Oil-Engined Air Liners of the Near Future

Helium leaves only a safer fuel to render the airship perfectly safe—Dr. Hugo Eckener.

TWELVE years ago the Hamburg-American Line was operating giant Zeppelins in regular passenger traffic within the confines of Germany. Undoubtedly it was the dream of Albert Ballin who had built up the successful organization which bore that name, that the time would come when the lighter-than-air type of vessel would be employed in trans-atlantic service. His introduction of the Zeppelin for traffic in Germany undoubtedly was for the purpose of gaining the experience that would enable him later to cope with the much bigger problem of trans-oceangoing service. Since those days many Zeppelins or other types of big dirigibles have been lost. A large part of this frightful menace which has hitherto handicapped the airship, is eliminated by the use of helium. It is no use imagining, however, that the substitution of this gas for hydrogen has completely overcome the peril. There still remains the dangerous gasoline carried in huge tanks and piped right along the vessel.

Before real commercial success can be obtained with the big dirigible the propelling power must be changed and the gasoline engine must give way to a heavy-oil engine. We understand that this necessity was long ago acknowledged by the British Air Ministry which fostered the development of a type of oil-engine of sufficiently light weight to be used satisfactorily in these giant air craft. Commercial exploitation of airship travel is not yet sufficiently close to our present day views to justify any private engine manufacturer developing the type of motor that is needed. It behooves Congress, therefore, not only in the interest of the development of the airship but for the protection of the lives of the men in the army and navy who have to take their chances in the air, to appropriate a sufficient sum of money to enable the technical staffs of these two government departments to develop a suitable engine. With the limited funds available considerable development and research work with airship type oil engines has been made at the Langley Field, but that is totally inadequate, and ample funds should quickly be made available, and an oil-engined ZR-3 will be at hand within two or three years.

Financiers Recognize Diesel Engine as a Factor

IT augurs well for the future of the heavy-oil engine in America that our financiers are coming to recognize its importance in corporation economy. The fact that a company is fitting its vessels with Diesel engines is now recognized of sufficient importance in its bearing upon earnings for chronicle in financial reports.

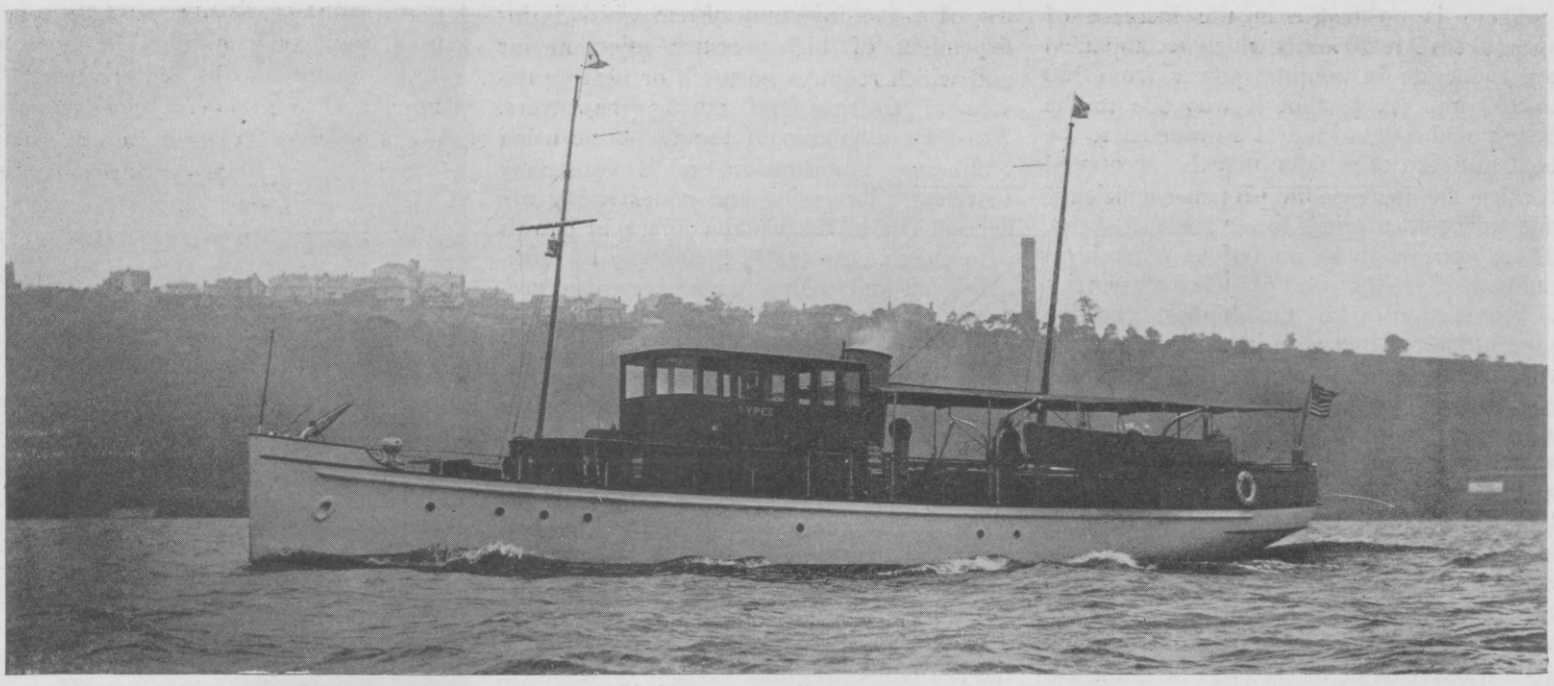
The October 6th issue of *Barron's,* one of the leading financial journals in America, contains several interesting references to Diesel engine economies. Commenting upon the fact that the objective of the United Fruit Company has been to reduce operating costs to a minimum, *Barron's* says: "That is why Cutter (the new president) was permitted to convert tropical buildings into concrete, to reballast railroads, revamp sugar mills and acquire choice virgin lands, and that is why all of the old ships have been completely overhauled and new cost-saving Diesel engine ships acquired."

In another section of the same issue, *Barron's* says, in referring to the earnings records of the International Mercantile Marine:

"Shipping men now acknowledge the freighter of the future will be Diesel-propelled. These engines have shown in innumerable demonstrations under actual conditions, particularly in foreign merchant marines, that they are the most economical propulsion units for sea transportation yet devised. When freight business revives and it is apparent that re-establishment of Germany's credit position through application of the Dawes plan is inevitable, competition for freight transportation will be of the cut-throat variety. More and more motorships are being built and fewer coal-burners.

"At present the shipping world is awaiting results of tests the Shipping Board will make of different types of Diesel engines to be installed on 12 of its vessels. Probably the most satisfactory type will not be decided on for at least a year and a half, because delivery under contracts to be awarded October 14th are not expected for from six to ten months, and sea tests will consume the better part of a year. Establishment of a Shipping Board standard motor, however, will launch the era of motorships in this country.

"Much existing tonnage here can be converted into motorships to compete with new vessels of this type. The cost averages between $450,000 and $750,000, depending on size of the vessel. International Mercantile Marine has a fleet of 70 freighters, none of which is Diesel-propelled, but of which a few are oil-burners. Many of this fleet would logically be expected to undergo conversion to put them on a competitive basis.



One hundred Diesel horsepower on the yacht "Typee" do better than 150 h.p. of gasoline horsepower formerly did. A knot has been added to her speed as the result of the conversion

Converting Yachts to Diesel Drive

Conversion of the "Typee" From Gasoline Power Adds One Knot to the Speed and Multiplies Cruising Radius More Than Fivefold

IT would be difficult indeed to name some class or type of vessel or craft propelled by sail, gasoline, or steam power in which the substitution of oil engines does not effect an improvement. As far as the big cargo carriers are concerned, the wholesale conversion pragramme of the United States Shipping Board gives a sufficiently plain indication. On the other hand, vessels of an entirely different character, such as yachts, for instance, furnish almost equally striking evidence that it is better to propel them with oil engines than with any other type of prime mover.

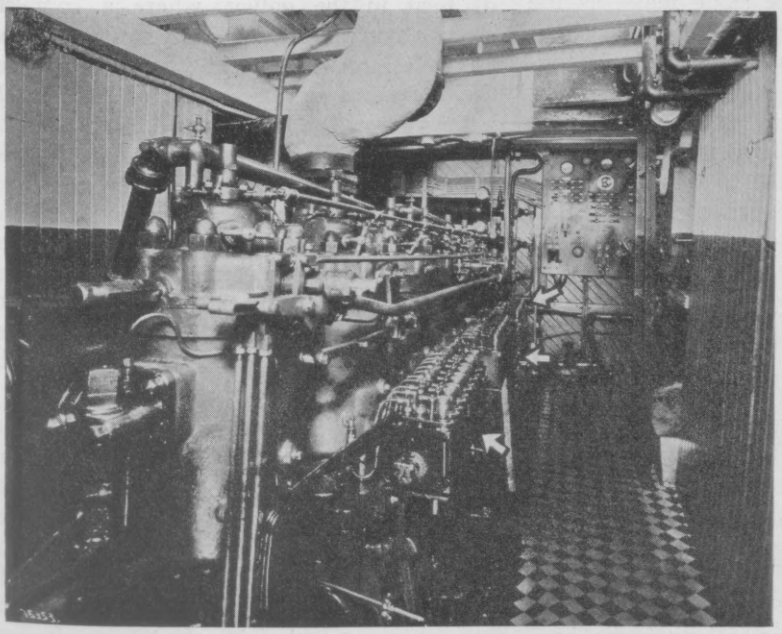
Converted from gasoline power to oil-engine drive, the yacht TYPEE brings into prominence the advantages which are to be secured. Since yachts are more or less luxury articles it is questionable whether oil engines are used on them primarily in order to reduce fuel costs; "money is no object," as the saying goes. But greatly reduced fire risk, increased cruising radius, less space occupied by fuel, and independence of fuelling stations are very much of an object and are valued so highly by yachtsmen that they are turning to the oil engine drive in ever increasing numbers.

As the result of substituting an oil engine for the gasoline engine which he formerly used, the owner of the TYPEE, W. N. Shaw, has considerably enhanced the desirability of his yacht. He is the vice-president of the Mianus Diesel Engine Company and will use the boat for private purposes and in order to demonstrate the engine. The former propelling plant of the TYPEE consisted of a 150 h.p. heavy-duty gasoline engine, whereas she has now been equipped with 100-s.h.p. six-cylinder Mianus oil engine running at 400 r.p.m. and using oil fuel. A "before and after" comparison is given below.

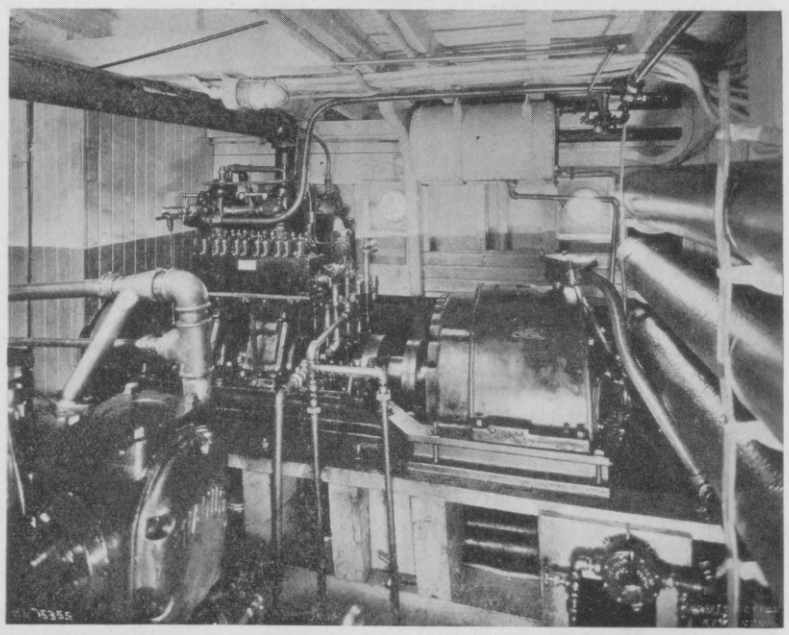
CONVERSION OF YACHT TYPEE

Length	85′ 0″
Beam	15′ 0″
Draft	5′ 5″

	Gasoline Driven	Oil Engined
Power	150 s.h.p.	100 s.h.p.
Speed	9 knots	10 knots
Gas. req. per hr.	20 gals.	7 gals.
Cost per hour	$3.50	60 cents
Cruising radius	160 miles	900 miles



Airless-injection Diesel engine of the yacht "Typee." The arrows show the batteries of lubricators which supply oil to practically all the moving parts

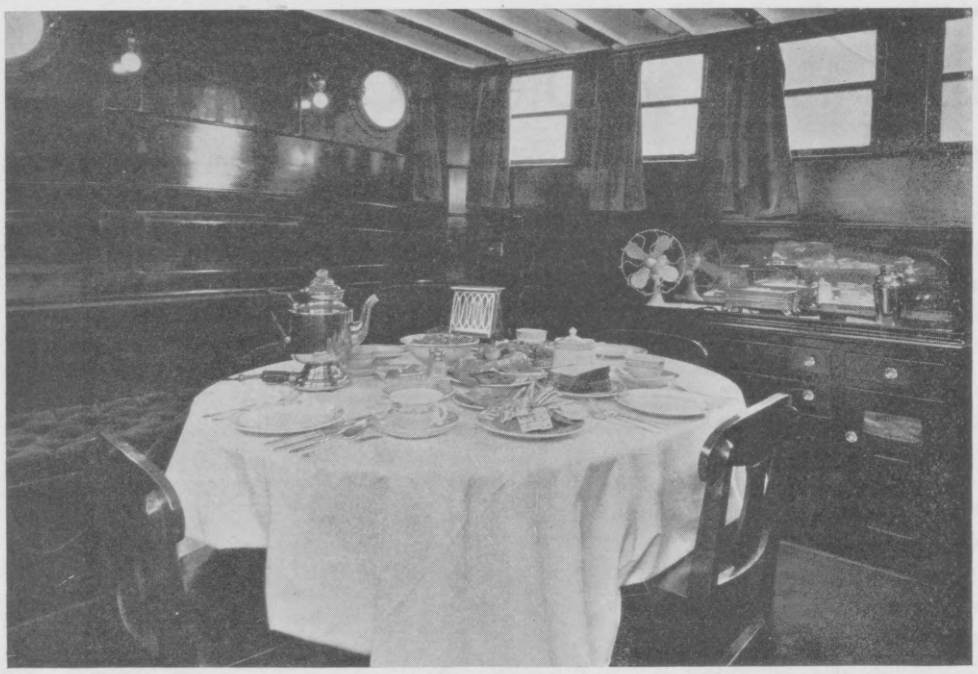


Auxiliary Diesel-engined electric auxiliary generator furnishes current for many purposes, including cabin heating. Compact air-starting bottles can be seen at right

There is no magic in the increase of speed from 9 to 10 knots which accompanied the reduction in nominal power from 150 to 100 h.p. A part of it was due to the fitting of the right kind of a propeller to the boat and the remainder may be accounted for by the increase in propeller efficiency due to the oil engine's lower rotative speed. There appears to be no serious obstacle in the way of getting good propeller efficiencies in connection with the highest rotative speeds that are met with in oil-engine work, whereas the propeller driven by the much higher-speed gasoline engine appears to be more or less permanently handicapped in this regard—particularly if the hull form and displacement remain unchanged. In looking over the table of comparisons it is necessary also to bear in mind that the running cost per hour includes the expenditure for lubricating oil. A quart of oil per hour is required by this size of oil engine.

Characteristic of the Mianus design is the use of a fuel-injection system which is independent of high-pressure injection air and which requires no torch or heating device at starting and during maneuvers. Since the engine is of the two-cycle using crank-case compression, it is essentially valveless. Reversing and maneuvering are carried out in the usual manner by means of a clutch. As far as the supply of lubricating oil and cooling water are concerned, everything necessary is built into the main engine, but for supplying power as needed for lighting and heating purposes, an additional two-cylinder 15 s.h.p. oil engine of the same make has been installed direct-connected to a 9-kw. electric generator running at 555 r.p.m. The fact that special mechanical force-feed lubricators are fitted to all the cylinders, etc., makes it a simple matter for the engineer to assure himself that all moving parts are reliably supplied with oil and accounts in a large measure for the low lubricating-oil consumption attained.

Electric stove and hot-plate makes this a clean, comfortable galley



Dining saloon of the yacht "Typee" showing electric percolator and toaster

Electric cooking and baking are outstanding features of motor-yacht equipment

For the supply of starting air a 3-h.p. kerosene engine of the same make as the main and auxiliary oil engines has been fitted and as it is capable of being hand-started on kerosene, the rest of the power plant is insured against going "dead" for want of starting air. Fire and bilge pumps are also direct-connected to this unit. For the supply of electric lighting current a 100-hour storage battery is installed.

As on large cargo and passenger ships, it has been found both economical and convenient to install a mechanical refrigerating system, in this yacht, and it is capable of preserving all the food supplies needed by the owners and crew and which is self-contained in the sense of not needing to be periodically supplied with blocks of ice. It consists merely of a small motor-driven compressor discharging into water-cooled condensing coils and supplying condensed liquid SO_2 to expansion coils located inside of what would ordinarily be the ice box. In addition to keeping the latter at the requisite low temperature for the preservation of perishable foodstuffs, the expansion coils are also arranged to freeze cubes of clear water for table use. No thermostat is used on the system since a back-pressure operated relay cuts the driving motor in or out as necessary for maintaining substantially constant temperature. As this apparatus has been designed mainly for domestic service, it requires none of the skilled attention necessary for the ammonia machines generally used on shipboard.

Some of the other domestic fittings used on the TYPEE also show a due regard for the latest improvements which are being offered. Heating of all the quarters is accomplished by direct electric radiation from protected units placed under the control of individual electric switches. Current for them is supplied by the oil-engined generator already referred to. Electric heating is also employed to good advantage in the saloon, which is equipped with a percolator and toaster. Electricity is the only source of heat in the galley, where a complete electric cooking and baking stove and also an independent electric hot-plate replace the far more cumbersome and less cleanly galley range. Owing to the absence of fire and steam from modern motor vessels, no matter for what service they are used, it is becoming increasingly common to find most of their heating needs taken care of electrically. At the same time the neatness and attractiveness of the latter method are increasing the demand for it quite independently of the necessity of finding a substitute for steam and coal.

While she was gasoline-propelled the TYPEE was known as the SYBILLA II and her new name was chosen with reference to the title of the sequel to the famous sea story "Moby Dick." The vessel which bears the name MOBY DICK has also been fitted with auxiliary power of the same manufacture as that installed in the TYPEE. In both boats the use of oil engines has given them a cruising radius very con-

Equipment of the Yacht "Typee"

Main Propelling Engine	100-h.p., 6-cyl., 400 r.p.m.	Mianus Diesel Engine Company
Reverse Gear and Clutch	Mechanical type	Joe's
Propeller	42"x40"	Columbian
Auxiliary Engine	15-h.p., 2-cyl., 555 r.p.m.	Mianus Diesel Engine Company
Auxiliary Generator	9-kw., 110-volt	Diehl Manufacturing Company
Standby Engine and Compressor	3-h.p., 1-cyl., Kerosene	Mianus Diesel Engine Company
Lubricators, all Engines	Force feed	McCord
Piston Rings	Peened type	American Hammered
Standby Lighting Set	100-hour Storage Battery	Edison
Lubricating Oil Pump	Rotary	Trimount
Lubricating Oil-Filter	Bag type	S. F. Bowser
Refrigerating Plant	SO^2 Direct Expansion	Frigidaire-Delco
Heating Equipment	Electric	Westinghouse
Galley Stoves	Electric	Westinghouse
Percolator	Electric	Westinghouse
Toaster	Electric	Westinghouse

siderably greater than that which they would have had with gasoline power. The TYPEE furnishes a particularly good example of what can be done with oil engine power towards producing a pleasure vessel with characteristics that are desirable in every way. Many other large yachts could likewise be converted with advantage.

German Passenger Liner "Rio Bravo"

First Diesel-Driven Vessel With Two Stacks

What may be considered as one of the most attractive looking twin-screw Diesel-driven passenger vessels yet placed in service is the RIO BRAVO, a liner of moderate power and size which started on her maiden voyage to Vera Cruz on August 5th. She has been built and engined at Krupps for H. Schuldt's Ocean Line of Flensburg for trading between German and Mexican ports via Southampton, England. Her dimensions are as follows:

Displacement	9,500 tons
Deadweight capacity	5,400 tons
Power	2,800 s.h.p.
Engine speed	125 r.p.m.
Ship's sea speed	13 knots
Daily fuel-consumption at sea	13 tons
Fuel-consumption per voyage from Hamburg to Mexico	221 tons
Length	394' 3"
Breadth	52' 7"
Depth	27' 11"

Her twin Diesel engines each has six cylinders 25.59" bore by 39.37" stroke and develops 1,400 s.h.p. at 125 r.p.m. Boiler-oil is to be used as fuel, heating coils being arranged in the double-bottom tanks for this purpose; but no arrangements have been made to purify the fuel-oil with the exception of the installation of three settling tanks and a series of filters. All auxiliary machinery and deck gear are electrically driven, there being three 150 b.h.p. Diesel-driven 100 k.w. generators for this purpose. The heating of the accommodations is by steam, two donkey boilers taking care of the same, steam also being used for cooking and for heating the fuel bunkers. It will be noticed that she has two stacks. Very shortly a sister to the RIO BRAVO will be placed in service. She is named the RIO PANUCO.

A Dutch Conversion

The Rotterdam Steamship Company's WIERINGEN, EX-TORBINIA left for South America on her maiden voyage on October 11th. Her turbine machinery has just been replaced by a Schelde-Sulzer 1,150 s.h.p., at 85 r.p.m. Diesel engine.

Society of Naval Architects Meeting

The motorshipping subject will be more completely represented than usual at the 32nd General Meeting of the Society of Naval Architects and Marine Engineers to be held at the Engineering Societies Building, 29 West 39th Street, New York, on Thursday and Friday, November 13th and 14th, commencing at 10 A. M. each day.

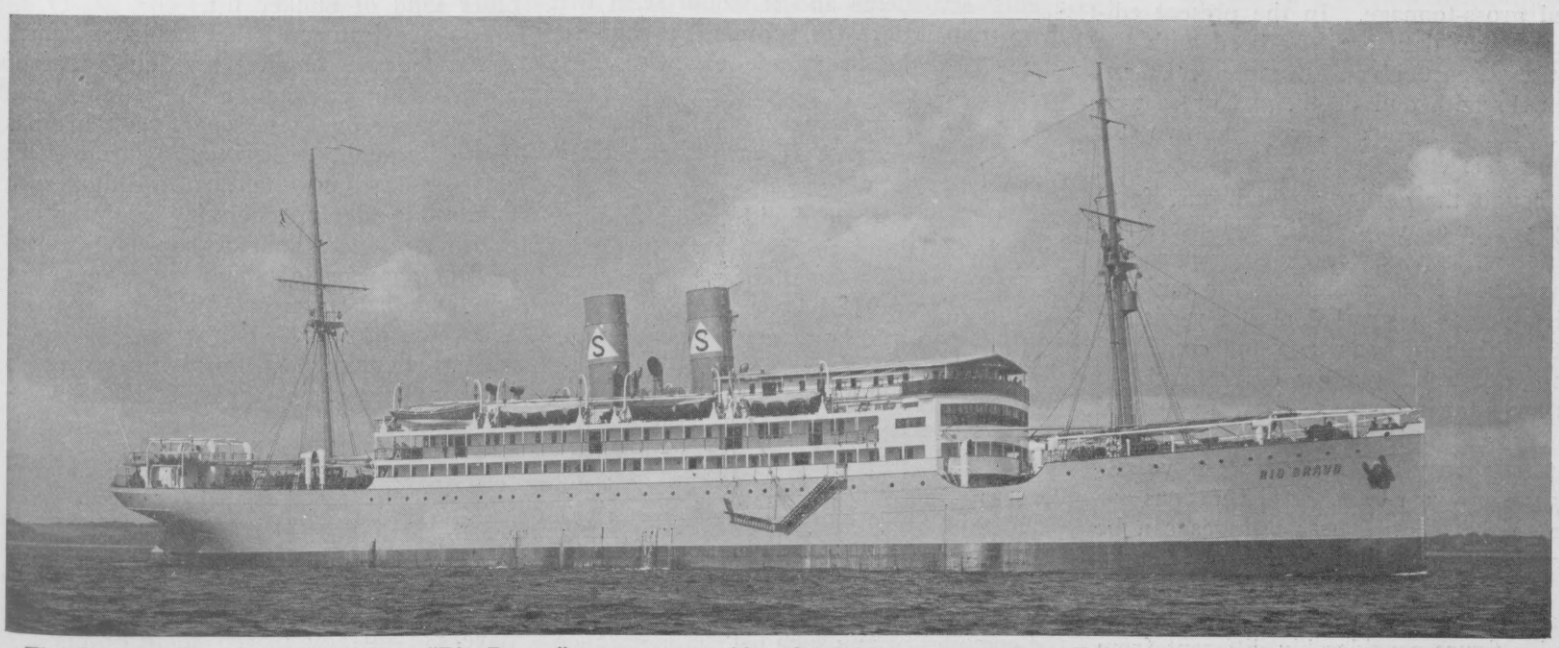
Problems in connection with the conversion of the Hog Island steamer SEEKONK to a Diesel-driven motorship will be discussed by James C. Shaw of the Wm. Cramp & Sons Ship and Engine Building Company, Philadelphia. Arthur B. Homer of the Bethlehem Shipbuilding Corporation, Bethlehem, Pa., will read a paper entitled "Trials and Operation of the Ore-Carrying Motorship CUBORE."

A subject of paramount importance at this time is that of "Dieselization" of towboats. Frank L. Dubosque of the Pennsylvania Railroad will discuss the installation and operation of the Diesel-electric towboat P.R.R. 16. Captain W. D. Styer of the U. S. Army will read a paper on seagoing hopper dredges. It will be recalled that the War Department has four Diesel-driven vessels of this class in service.

The annual banquet of the Society of Naval Architects will be held at the Waldorf-Astoria at 7:15 P. M, November 14th. Members tickets will be $6, non-member guests $12.

Converted Ship's Second Voyage

The American motorship ASHBEE recently completed a second voyage from New York to ports in South America, the most southern of which was Tucapel, Chile. The performance has been about the same as it was on the first voyage. She came back in good condition notwithstanding the fact that she was cut short of two engineers at the southern end of the run and had to proceed as far as the canal with only two engineers aboard. The chief-engineer was seized with acute apendicitis. She is loading again for ports in South America for operation.



The first two-funnelled motor-liner, "Rio Bravo," a passenger ship of 9,500 tons gross, propelled by twin 2,800 s.h.p. Diesel Engines. She is owned by the H. Schuldt Flensburg Steamship Co. of Flensburg, Germany and has already started on her maiden voyage to South America. A sister motorship is completing—the "Rio Panuco"

Motorship Yearbook For 1924

Revisions Made After Exhaustive Research Make This Volume of the Greatest Possible Value to the Entire Marine Industry.

THIS month the 1924 MOTORSHIP YEARBOOK will come off the presses and will be on sale at our office. This book is the only publication of its kinds in the world assembling in convenient form all the special information needed by shipbuilders, naval architects, marine-engineers and ship operators.

Owing to the rapid development of the motorship movement from a small beginning to an ever-enlarging factor in the shipping world changes take place very rapidly in the rules and regulations affecting the various industrial and operating branches, necessitating periodical revision of the contents of the volume. The present edition has been brought right up-to-the-minute and it puts the previous edition completely out of date.

When the YEARBOOK was first started the number of motorships that had been built was relatively small compared with the figures of these present times. It was possible in the first two editions to include all oil-engines vessels of over 200 horsepower. In the present edition it has been found possible to embrace only boats having more than 300 shaft horsepower. It was found that below this power there were so many small craft which cannot be accurately checked by any of the available records.

In earlier days it was possible for the publishers of MOTORSHIP to keep in touch with practically every intallation made throughout the world. To-day this is impossible. Reliance has now, therefore, to be placed upon the government records of different countries, and upon the information rendered available by the numerous classification societies. This has brought about one considerable change in the data given in the motorship tables. In earlier editions the dimensions of the ship were based upon information supplied by the builders and were, therefore, length b.p. moulded-breadth, moulded-depth and designed gross-tonnage. In the present edition the ship data are in accord with the registration particulars, being the registered length, breadth and depth, and gross tonnage. The difference between the two sets of figures is considerable.

Although the earlier method was, from many points of view, the more useful, it was not well suited for checking purposes in the case of ships built in far outlying foreign ports, in small domestic yards, or constructed many years ago and converted to motor power. On the other hand the registered dimensions are those in general uses for vessels in shipping service. The registered gross tonnage of some vessels changes from year to year as alterations are made to the ship. These changes can be incorporated in the MOTORSHIP YEARBOOK list. Where the builders designed gross tonnage was recorded it sometimes presented a figure considerably different from that actually registered. Indeed not infrequently the first measurement of a vessel for government records would show immeasurable variation from the designed tonnage, due to changes decided upon during the construction of the ship. This was sometimes confusing.

From time to time it was brought to our attention that subscribers to the MOTORSHIP YEARBOOK did not understand the difference between the shipbuilders' figures and the figures recorded by the governments of the different maritime countries.

It may truthfully be said that there is not in existence any comprehensive record of vessels of all sizes and nationalities that is free from errors. There are omissions, discrepancies and mistakes in every register record or list we have consulted. Not one of them is perfectly accurate. It would, therefore, be absurd for us to claim that the list in the MOTORSHIP YEARBOOK is free from blemish. We do believe, however, that its information on motorships, and of course, it contains no information on steamers or sailing vessels, is more precise and trustworthy than that to be found in any other volume. For months past we have been engaged in collecting the data and checking it with all important sources of information. We have had notable assistance from the American Bureau of Shipping and from Lloyds' Register, particularly in regard to vessels that are no longer in service. It has been a tremendous task, requiring endless care, a single vessel often taking hours of research work.

There is a constant interchange of information between all classification societies through the medium of their published information. This is checked against companies' record and also against owners' or agents' statements and it would seem that little road is left for error. The fact remains that the magnitude of the task is so great that it is impossible to guarantee against inaccuracies arising in all sorts of ways. But our list is as accurate as is humanly possible.

A government record will sometimes show information different from that furnished by an owner. This again in turn may differ from that furnished by a captain, and in its engine particulars may not agree with data furnished by the chief-engineer. In such instances it is very difficult to arrive at the correct data. Occasionally the discrepancy between the various statements can be traced to changes of recent occurrence. In other cases there seems to be no other explanation than that "nobody cares."

There are also other pitfalls awaiting the compiler of any such list. For instance, deadweight tonnage figures vary almost every time they are quoted. The shipbuilders' deadweight figures are always reduced by the time the vessel gets into service, because of the stores, etc., put aboard by the owner or his agents. In the case of large companies the deadweight figures obtained from the owners are reliable because they are accurately measured by competent surveyors. Frequently in the case of vessels belonging to an individual owner or small company the deadweight figures are a guess.

We have taken every possible care in compiling the data for the MOTORSHIP YEARBOOK. We have run down many discrepancies in checking owners' statements. Our original policy has been to check the data furnished by the shipowner with that of the government of the country under whose flag the ship is operated. In cases where the ship was classified by any of the Societies of the Bureau another check could be obtained from their figures. The proportion of errors in such information is reduced more nearly to nil in such cases than in any others. There are, however, many ships—particularly the smaller ones—that are not classified anywhere, and the existence of which can only be traced from government records.

In no case has any data been included when the information was not available from one of the standard sources. This means, of course, that a number of boats which cannot be very well computed have been omitted. Before the next edition of the YEARBOOK appears we hope to be able to check a number of these so that they may be introduced into the list for purposes of historical accuracy.

Among the new features of the YEARBOOK is a list of bunkering stations throughout the world, arranged geographically. This arrangement does not appear to have been previously attempted in such a comprehensive form in any other publication and is, undoubtedly, more useful than any other kind of bunker list.

Another feature of the YEARBOOK which has undergone complete revision is that of questions and answers on the operation and maintenance of Diesel engines. This has been thoroughly rewritten by competent engineers and now takes a form of such high value that no operating engineer can afford to be without a copy. Superintendent-engineers of shipowning companies will find that a study of this section will be of the greatest help to them in supervising the engine departments of the vessels in their charge, and will bring about a better understanding of the Diesel engine.

As a volume of reference the MOTORSHIP YEARBOOK is indispensable to everyone associated in any way with motorships. It contains much information that is not available anywhere else and offers it in a very handy and convenient form. Those who have not already placed their orders are recommended to send them in at once—Price $3.

Japan's Motorship Marine Well Under Way

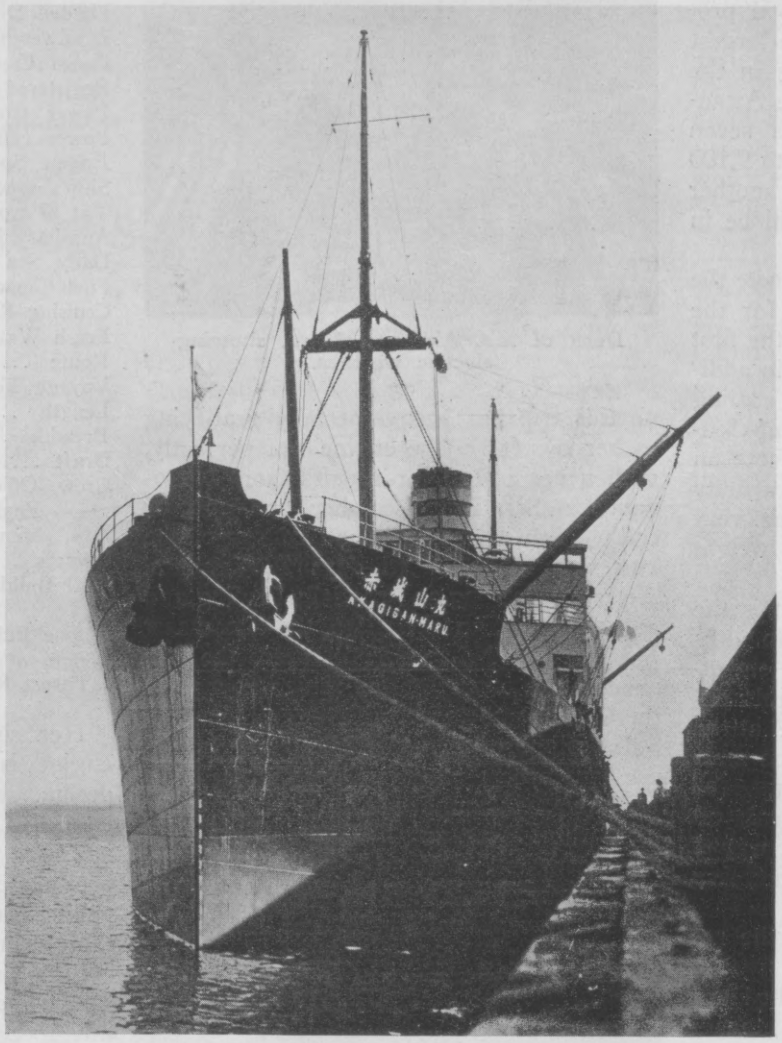
Fifteen Large Diesel-Driven Vessels Now Being Built or Just Completed. The AKAGISAN MARU *Visits San Francisco, Cal., and Seattle, Washington, on Maiden Voyage*

WHILE hundreds of oil-engined schooners and workboats have been built in their country, Japan shipowners have been slow to adopt Diesel propulsion for their large merchant vessels on the Western Ocean, but not so slowly perhaps as our own Pacific coast shipowners, who already have difficulty in competing against oriental craft operated at much lower costs. Japan, however, during the past year has taken up big motorship construction in a vigorous manner, and now has a program of fifteen Diesel-driven ships under way, if we include a couple of such craft just placed in service. One of the latter is the AKAGISAN MARU, the main subject of this article, and which motorship recently called at San Francisco, Cal., and at Seattle, Wash.

At various times the different motorships building in or for Japan have been listed in our pages and we will enumerate them now. Of the first motorship—the ONDO MARU—details are not available, but she is 170 ft. by 28 ft. and is equipped with twin 600 s.h.p. Vickers, four-cycle airless-injection oil-engines shipped last year from England to the order of the Mitsubishi Shoji Kaisha, which concern recently ordered two more 600 s.h.p. units for a second and sister motorship.

Sulzers of Winterthur, Switzerland, also received an order some months ago for two 1,800 s.h.p. two-cycle Diesels for Japanese motor vessels, but particulars are not before us as we write. The ship is building in Great Britain.

The Osaki Shosen K. K. of Osaka, recently ordered Sulzer Diesels for three large twin-screw combination passenger-cargo ships now building at the Mitsubishi Zosen K. K.'s yard at Nagasaki, who are constructing one pair of the engines under license, Sulzers building the remaining two sets in Switzerland. In each boat twin 2,300 s.h.p. at 112 r.p.m. two-cycle units are being installed. This Japanese concern also ordered twin 800 s.h.p. trunk-piston type Burmeister & Wain Diesels for a passenger vessel of 1,200 tons to operate on the Inland Sea of Japan.

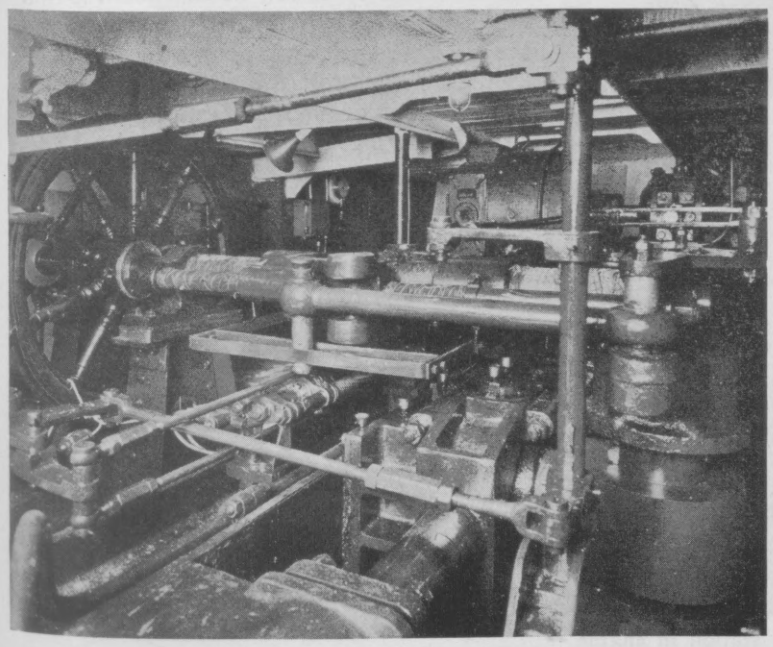


The first large Japanese motorship to visit an American port..

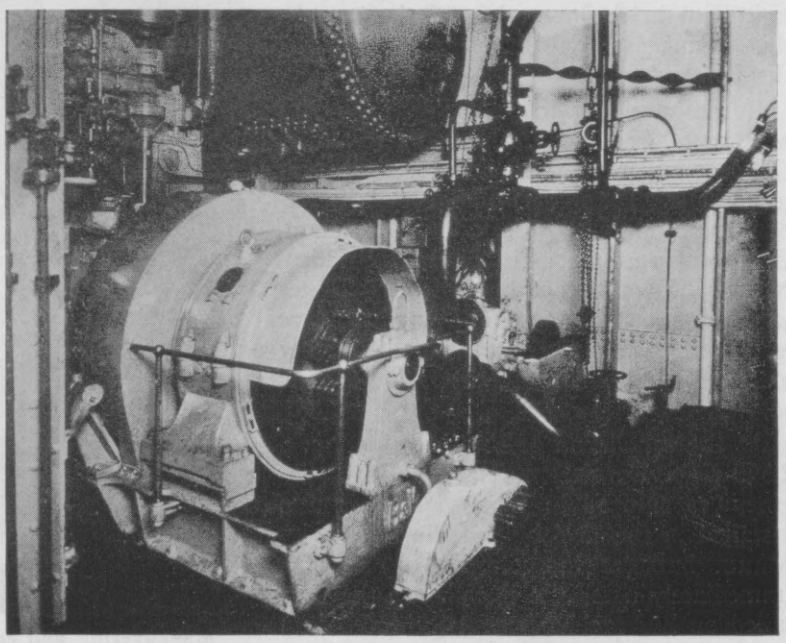
Mitsui & Co. have four motorships on hand, one being the AKAGISAN MARU, another being a 12,000 tonner building in Japan, while two 10,300 tons d.w. single-screw freighters will shortly be delivered to them by the Götaverken of Göteborg, Sweden, in each of which craft a 2,300 s.h.p. Götaverken-B. & W. Diesel is being fitted.

The Nippon Yusen Kaisha is having two twin-screw 10,000 tons cargo-passenger liners of 4,000 s.h.p. built in Scotland, one at Lithgow's, Port Glasgow, to have two 2,000 s.h.p. Sulzer Diesels, and the other at Harland & Wolff's Henderson Yard, Glasgow, in which twin Harland-B. & W. engines are being installed. The Sulzer engines are in the ATAGO MARU.

Lastly there is the motorship either now building or recently completed in Japan, propelled by twin 2,500 s.h.p. Brown-Fullagar opposed-piston Diesel engines built on the Clyde. But we must not omit the conversion of the Toyo Kisen Kaisha's two 13,000 ton steamers TENYO MARU and SHINYO MARU, the Diesels for which are to be German built. The foregoing represents quite an important list, and sufficient to furnish increased competition



The Akagisan Maru's steering gear.



One of the auxiliary Diesel-driven generators.

against American steamers on the Pacific ocean, that are already operating at a disadvantage.

Trans-pacific shipping companies are now watching with keen interest the operation of the AKAGISAN MARU recently completed by the Mitsui Bussan Kaisha at their shipyards at Tama, Japan. The new motorship, which is the first to engage in the Trans-Pacific trade under the Japanese flag, lately completed her maiden voyage from Yokohama to San Francisco and other Pacific Coast ports, and as we write is on her way back to Yokohama with a cargo of lumber, machinery and various food products. Mitsui & Co. is one of the largest of the Japanese interests engaging in the Trans-Pacific business. Besides the AKAGISAN MARU this concern operates seven large steamers ranging from 8,200 to 9,100 tons, and, as stated, is building another motorship of 12,000 tons which will be in operation within six months.

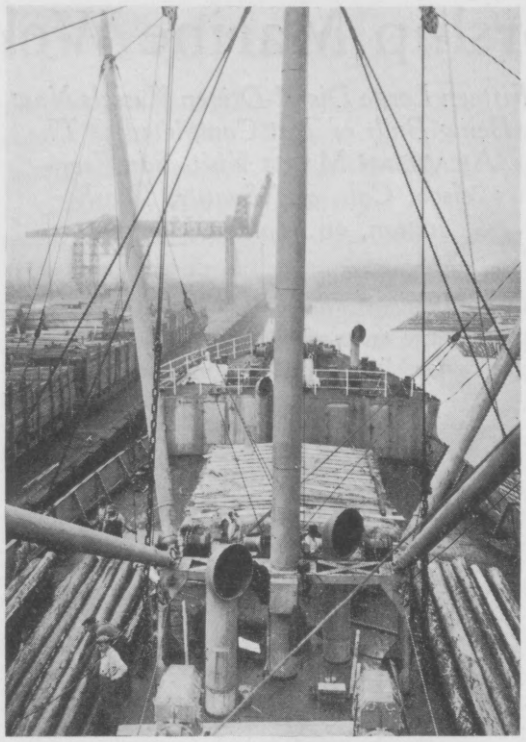
There are several factors which make the Pacific a very profitable territory for the development of motorshipping. In the first place, the great distances involved, in addition to the few and far separated coaling and oiling stations, compel steamships engaging in the Oriental trade to devote an unusually large proportion of their capacity to coal or oil bunkers, thus cutting very materially into the space or dead weight which can be used for cargo.

A second important consideration is the great cruising radius of the motorship without re-fueling as compared to the steamship. Besides saving much time, this enables the motorship to secure its fuel at the points where it can be purchased the most economically. The AKAGISAN MARU, for instance, fills her tanks with California oil at San Francisco, securing in this way a reduction of something like twenty-five cents a barrel.

A further economy is found in the reduced engine-room crew required by the motorship, where a few highly skilled engineers take the place of the many stokers on the steamers. In the Trans-Pacific trade, where labor costs are an especially important item in the operation of the vessels, this saving is particularly appreciated by the owners.

Before deciding to power one of their new boats with a Diesel engine, Mitsui & Co. sent representatives all over the world to make careful studies of the latest developments in motorship design and operation. Engineers were placed in England, Sweden, Norway, Denmark and the United States where the various types of engines were examined with a view to their adaptability to the conditions of the trans-Pacific service.

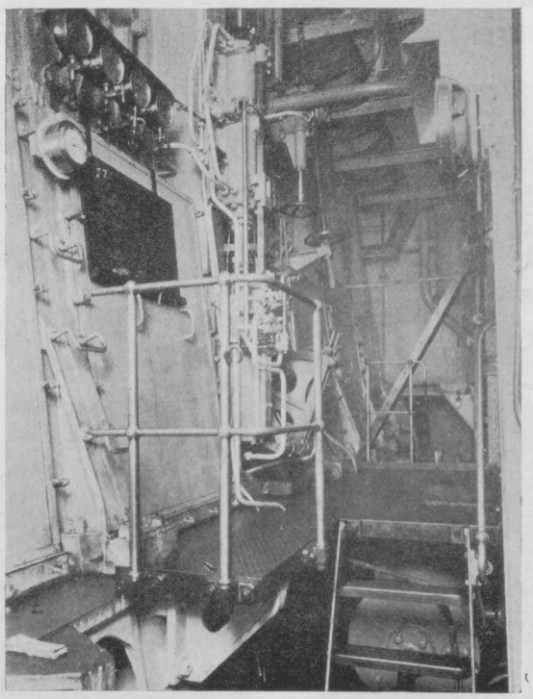
At the conclusion of the investigation, a 2,580 i.h.p. Burmeister & Wain Diesel engine was shipped to Japan where it was installed in the steel hull of the AKAGISAN MARU, built at the company's shipyard. Immediately after the installation the ship sailed on her maiden voyage without even the customary trial trip. Her performance



Deck of m.s. Akagisan Maru, showing electric winches.

on this trip has been especially gratifying to her owners. The engine ran perfectly, with never a stop for repairs from Yokohama to San Francisco, her first port of call. With a one-half load of cargo, the run was made in 16 days 22½ hours. After discharging and partially loading and re-fueling at San Francisco, the AKAGISAN MARU proceeded to Seattle where the balance of the cargo for the return voyage to the Orient was taken.

In building AKAGISAN MARU the Japanese have proceeded with characteristic thoroughness. Though not an exceptionally large ship, being only 375 feet long by 50 feet beam and of approximately 2,810 tons net register, she is modern in every respect. Of the conventional freight boat design, she has large cargo holds fore and aft with the bridge and officers' and crew's quarters



Maneuvering and control station in engine room.

amidships. All auxiliary equipment, such as loading winches and anchor hoists, are electrically operated, deriving their current from the three large generators in the engine room. The ship is electrically heated and all cooking is done with oil for fuel. The electrical steering apparatus is direct connected to the tiller head by gearing, there being no quadrant. This, her operators claim, gives a much more positive and satisfactory control than the quadrant arrangement.

The AKAGISAN MARU has the following dimensions, etc.:

Loaded Displacement	9,743 tons.
Deadweight Capacity	7,300 tons.
Cargo Capacity	320,252 cu. ft.
Registered Tonnage	2,810.5 tons net.
Power (indicated)	2,580 i.h.p.
Power (effective)	2,000 s.h.p.
Engine Speed	95 r.p.m.
Ship's speed at 1,800 s.h.p. at 87 r.p.m.	11½ knots.
Auxiliary Diesels	3 of 75 b.h.p.
Daily Sea Fuel-Consumption	7 tons.
Fuel Capacity	700 tons.
Cruising Radius	27,000 naut. miles.
Fresh Water Capacity	83 tons.
Route	Japan, China, U.S.A.
Voyage Time	17 days.
Length	375′ 0″
Breadth	50′ 0″
Draft	24′ 3½″
Crew, Officers	5
Engnieers	5
Men	25
Owners	Mitsui & Co.,Tokyo.
Hull Builders	Mitsui Bussan Kaisha, Tama.
Engine Builders	Burmeister & Wain.
Length of Engine-Room and Thrust Recess	58′

Her single Burmeister & Wain Diesel engine is of the long-stroke, slow-speed design, delivering its maximum continuous load of 2,580 i.h.p. at 95 r.p.m. The s.h.p. is 2,000. The weight of the engine is approximately 420 tons. Although the propelling plant is designed to turn at 95 r.p.m., the owners found it necessary to run it at only 86 or 87 r.p.m. to give the AKAGISAN MARU her desired speed of 11.5 knots. At this speed 1,800 shaft h.p. or 2,300 i.h.p. are developed. The power plant can be slowed down to as low as 23 r.p.m., giving the boat a bare maneuvering speed. There are six four-cycle cylinders with a bore of 29.13″ and a stroke of 59.05″ and with a piston speed of 950 feet a minute. The single screw has a pitch of 12′ and a 15′ 9″ diameter.

The fuel consumption on the first voyage was found to be seven tons per 24 hours, or about 130 grams per i.h.p. hour. Seven hundred tons of California oil are carried in five double-bottom fuel tanks which give the AKAGISAN MARU a cruising radius of over 27,000 miles. Two day tanks each holding 4.2 tons are installed in the engine-room which supply the engine direct. It was found that a fuel of 25 Beaumé was most satisfactory for the engine's operation.

Four pumps are used, one for the bilge, one for lubrication, one combined lubricating-oil and cooling-water pump, and one ballast. All are driven by electricity from

the main generators. The auxiliary Diesel engines are installed in the engine-room at the forward end of the main power plant and consist of three 75 h.p. B. & W. Diesels running generators giving a total of 150 k.w. These supply current for operating the Lawrence Scott cargo-winches, the Clarke-Chapman anchor winch, the John Hastie & Co. steering machine, as well as furnishing power for lighting and heating. All of the auxiliaries are in the engine-room, which is very compactly arranged, being 58 feet long, including the thrust space. There is no independent air-compressor required, the auxiliary Diesels having an oversupply for this purpose. An emergency hand compressor is carried, however, to comply with Lloyds requirements. The owners of the AKAGISAN MARU are especially pleased with the large cargo space which the Diesel installation on the ship allows. Although this motorship is only of 9,743 tons loaded displacement, the five large cargo holds have a capacity of 320,252 cubic feet.

A crew of twenty-five men is carried. There are five officers and five engineers—the chief, three assistants and an electrician. The electrician, however, is only with the ship during her first voyage to make minor adjustments in the electrical equipment. It is a significant fact that all the officers and men are Japanese.

The Mitsui & Co. do not at present contemplate motorizing any of their steamers, believing that it is more desirable to build new vessels of the latest design for the installation of Diesel engines.

Emergency Generating Sets for Merchant Vessels

A Diesel-Electric Unit of Neat Design Developed in Great Britain

Years ago the White Star and Holland-America Lines originated the use of oil-engined generating sets for emergency purposes on the deck of their transatlantic liners, an excellent practice which has been followed by many other lines, including on the LEVIATHAN when she was reconditioned.

The advantage of oil-engines for this particular purpose is that a self-contained power unit is provided for operating wireless, floodlights, launching boats, etc., in case of accidents to the ship and the main machinery being put out of action. Furthermore, the possible emergency is provided for with a maximum of safety. Then again, an oil-engine is always ready to start at a moment's notice.

A compact power unit has been designed and developed for this purpose by the Campbell Gas Engine Co. of Hailfax, a representative of which concern is now travelling through the United States, and who courteously furnished us with information regarding this unit which, by the way, is also used for engine-room auxiliary power in motorships.

The engine attached to the generator is of the vertical four-cycle, airless-injection type. Regular turning, practically perfect balance, capacity for considerable momentary overloads, ability to run with one or more cylinders idle if necessary, are all special features of the design.

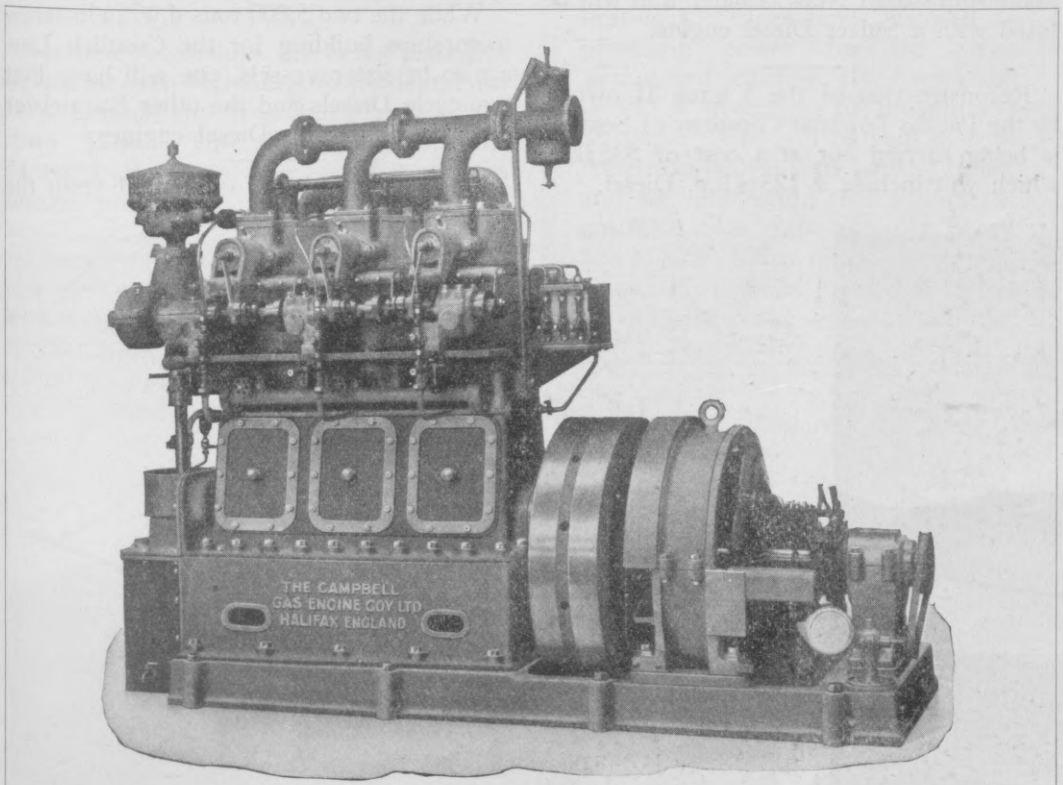
While not of the true Diesel design, these engines start up at once from the cold state without use of any lamp, electrical device, hot-bulb or hot plate. The charge is ignited automatically as with the Diesel and the whole of the cylinder and combustion head are adequately water-jacketed. Fuel is injected through a mechanical atomiser into the combustion chamber in the form of a fine spray or mist. Injection occurs at the end of the compression stroke, so that there can be no trouble from back-firing or premature ignition.

Governing is by the variable quantity system in which there is an injection at every cycle, the stroke of the fuel pump being increased or diminished by the governor. This system ensures the most regular speed, the greatest economy at all loads and uniformity of stresses in the working parts.

All cylinders are water-jacketed and have a removable liners of close-grained cast-iron which is of ample thickness to stand reboring when worn. Small engines up to 300 b.h.p. are of the trunk-piston type, but the larger engines are built with crossheads and slipper guides. All enclosed bearings, viz., crankshaft, crankpin and gudgeon-pin are fitted with forced lubrication, the pressure being produced by one or more positively-operated ram pumps. A separate forced-lubrication system is provided for the cylinders with a sight-feed for each.

The engines will use any fuel-oil a Diesel engine can use with equal economy. Any fuel-oil having a specific gravity of about 0.95 and a calorific value of about 18,000 B.T.U.'s per lb. is what is commonly used in the engines.

The Campbell Gas Engine Co., Ltd., of Halifax, England, claim to be the pioneer British firm of this type of oil-engine, having plants which have operated successfully since 1912, their complete internal-combustion engine experience covering a period of about 40 years. The illustration in connection with this article shows a 30 k.w. cold-starting heavy-oil engine driven auxiliary generating set similar to those fitted to the British warships HERALD, ORMONDE, HEATHER and LUFIN.



The Campbell engine-room or deck 30 k.w. emergency lighting set

Associated Oil Company's Motor Tanker Runs Trials

Among the motorvessels recently placed in service on the Pacific Coast by oil companies is that of the tanker PORT COSTA which ran trials on September 17th. She was built at the Moore Shipyard to the order of the Associated Oil Company of San Francisco, and is propelled by twin 110 s.h.p. Pacific-Werkspoor Diesel engines. The vessel is 110′ long by 30′ breadth and 9′ 6″ depth. Her loaded speed is 8 knots per hour. She is in charge of Captain Isak Carlsen, with Jack Thygeson as chief engineer, and will operate between Avon, San Francisco, Alameda and Stockton.

Big Vickers Engine

Vickers are developing a large Diesel engine for a fast passenger ship.

Interesting Notes and News From Everywhere

World's Record of New Construction, Ships' Performances and Other Matters of Note in the Motor Vessel and Oil Engine Industries

THE Diesel-driven tug LION is nearing completion at the yard of the New London Ship & Engine Co., Groton, Conn.

The Deutsche Werft of Hamburg launched the Swedish-owned motorship FERNBANK on September 9th.

Diesel oil can now be bought from the Panama Canal authorities at Balboa at $2.15 per barrel, or $2.35 at Cristobal.

The 5,200 tons gross motorship BIRCHBANK of the Bank Line was delivered by her builders on September 4th.

Four tankers announced last month to be built for Andrew Weir will have steam machinery and not Diesel.

The German motorship AEGIR was recently chartered by the Ford Motor Co. to transport automobiles in Scandinavian waters.

In the Pacific Coast steam tug WENOA a 170 s.h.p. Atlas Diesel engine is being installed by order of the Port of Portland Commission.

Success has been attained by Sulzer-Frérés with heavy fuel-oils as low as 11½ degrees Beaumé, in the operation of Diesel engines.

The world's largest tanker, the Diesel-driven ship ZOPPOT, has now covered 245,286 sea-miles in four years uninterrupted service.

CLYDEBANK, a 5,200 gross tons vessel, and the ninth motorship for the Bank Line ran trials on October 13.

Two 165 s.h.p. Enterprise oil-engines are being installed in two tugboats completing for the U. S. Engineers Corps in the Portland, Ore., district.

The Van Berkel marine oil-engine is now manufactured by the N. V. Motoren Maatschappij "Momaram" of Rotterdam.

SANTOS, a new motorship for the Johnson Line propelled by two 1,150 s.h.p. M.A.N. Diesel engines, was recently launched at the Kockums Yard, Malmo.

Several 4,000 s.h.p. double-acting Diesel marine engines are under construction at the plant of the North Eastern Marine Engineering Company, Wallsend-on-Tyne, aside from two 3,600 s.h.p. double-acting Diesels for the Anglo-Saxon Petroleum Co.

H. S. Kilchenmann, chief-engineer of the Diesel engine department of Sulzer Frérés of Winterthur, Switzerland, has been in the United States for several weeks.

For unknown owners a motorship of 8,000 tons d.w., to have a single-screw Sulzer Diesel engine is being built by William Denny Bros., Dumbarton, Scotland.

Now building at Livingston & Cooper's yard, Hull, England, is a 4,000 tons tanker which has been purchased by the Union Steamship Co. of New Zealand, and will be fitted with a Sulzer Diesel engine.

Reconstruction of the VICTOR II owned by the Pacific Towboat Company of Seattle, is being carried out at a cost of $35,000, which will include a 125 s.h.p. Diesel.

A twin-cylinder, two-cycle 24 b.h.p. Vickers-Petters oil-engine has been installed in the Dominion Fishery patrol launch GULL. A speed of eight knots has been obtained.

Diesel engines are to be installed in the tugboat fleet of the Chesley Tug & Barge Company, Seattle. The TEMPEST, a 75-footer, is now having her 150 i.h.p. steam plant replaced by a Diesel engine.

A bulletin dealing with motor-driven exhaust fans will gladly be sent gratis to anyone who writes to W. Stewart of the Diehl Manufacturing Company, Elizabeth, N. J., for a copy, mentioning this offer.

An 80 ft. wooden tugboat propelled by a 200 s.h.p. Fairbanks, Morse oil-engine is being built for John D. Hughes of New York by M. M. Davis & Co., for operation on the New York State Canal.

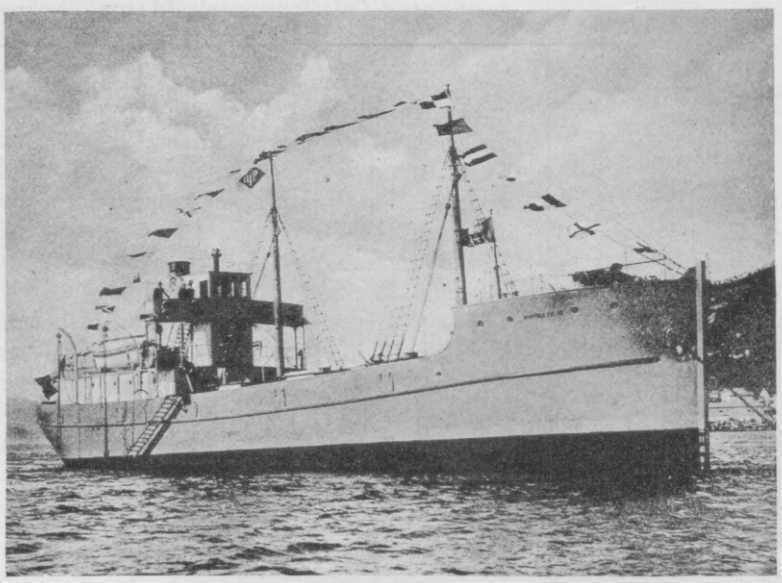
In the 50 ft. tug ROYAL owned by the Stanwood Towing Company of New York, a 120 s.h.p. Nelseco Diesel engine is being installed at Jacobson & Peterson's yard, Brooklyn, N. Y.

Now under construction at the yard of Eriksen Bros. for the Pacific Tug & Barge Co. is a 54′ by 14′ by 7′ tug boat to be equipped with a four-cylinder Fairbanks-Morse oil engine of 100 b.h.p. at 340 r.p.m.

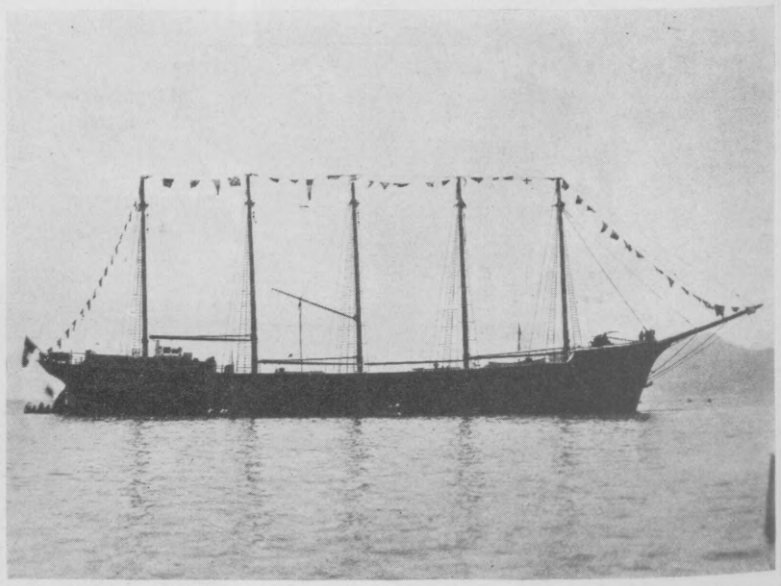
VINEMOOR, first of two 8,100 tons Doxford Diesel-engined motorships for Sir Walter Runciman's Moor Line, ran trials on September 25th. The engine is a three-cylinder, 2,200 s.h.p. opposed-piston unit.

While the two 5,800 tons d.w. twin-screw motorships building for the Cosulich Line are to be sister vessels, one will have Fiat two-cycle Diesels and the other Burmeister & Wain, four-cycle Diesel engines.

If sufficient subsidy is secured from the



Concrete motor-vessels are still in service in Italy. The 300 s.h.p. Tosi Diesel-engined tanker "Ernesto" which has been running for three years in the service of La Petrolifera Italo-Rumena



The 4,500 tons concrete auxiliary vessel "Perseveranza." She is equipped with twin 160 b.h.p. Tosi Diesel engines. One Italian concrete motortanker was on fire three times without serious damage

British government, a fleet of six 20,000-tons, 20-knot, Diesel-driven passenger ships are to be built and placed in a fortnightly service between England and Australia.

MOVERIA is the name of the 7,800 tons d.w. Diesel-driven cattle liner now being completed by Vickers at Barrow, for the Donaldson Line. Her length is 390 ft. with 51½ ft. breadth. She was launched on October 10th.

BRITISH MOTORIST, a 10,100 tons d.w. motor tanker for British Tanker Co., London, was lately launched at Swan, Hunter & Wigham Richardsons, and will soon run trials. A 3,200 h.p. Neptune Diesel engine is installed.

A second 10,000 tons Palmer-Fullagar Diesel-driven tanker is now under construction at Palmers Shipyard, Jarrow-on-Tyne. The ship will be a sister to the BRITISH AVIATOR owned by the British Tanker Co., Ltd., London.

Sometime next year Diesel engines may be installed in the two 80 ft. tugs RADIANT and BRILLIANT recently purchased by the Sheridan Company, 127 Walnut Street, Philadelphia, Pa., from the Atlantic Refining Company—says D. T. Sheridan.

After making 34 voyages of about 5,000 miles each, in addition to two long voyages to Europe, the American wooden motorship JAMES TIMPSON has been abandoned at sea in a hurricane with her decks awash. All the crew were safely taken off. The JAMES TIMPSON is one of the wartime built wooden ships, and is owned by Ichabod T. Williams & Sons, of New York. She is propelled by twin Winton Diesel engines.

Six new motorships are being placed in service between Hamburg, Rotterdam, Antwerp, London and West India ports by the Horn Line. The first of these, the THERESE HORN is now on her maiden voyage.

Two motorships of 4,650 gross tons each will be built for the Netherlands Royal Packet Co., Amsterdam, for their Deli-Straits-China Line. The contracts have not yet been placed, the decision only having recently been reached by the directors.

Axel Johnson's Nordstjernan (North Star Line) of Stockholm has ordered two 7,100 tons passenger-cargo motorships of 12 knots speed from the Götaverken, Gothenburg. Diesel engines of 3,400 i.h.p. will be fitted. Length 390′, breadth 52½′, depth 37′.

The salvage vessel SEEFOLKE equipped with twin 1,700 i.h.p. M.A.N. Diesel engines is about to run trials. She was built for W. Schuchmann at the Tecklenborg Shipyard.

"Entire reconstruction of the British merchant-marine will have to be faced if the new motor driven liner AORANGI is able to cross the Atlantic and Pacific economically."—*Sir Halford McKinder, Chairman, Imperial Shipping Committee.* This vessel runs trials during November.

The price paid to the Shipping Board by the Atlantic Refining Company for the 7,057 tons d.w. steel tanker ALLENTOWN was $88,212.50 cash. The consideration is that the vessel shall be converted to Diesel propulsion within one year from date of contract.

A 35 ft. by 9 ft. 6 in. boat driven by a Gardner 3 h.p. oil-engine connected to an air-compressor instead of a propeller and propelling the boat along by means of air jets, has been built by an Australian named Schroeder and tried out on the River Thames, London.

New York Ship Building 13,000 Tons Diesel Tanker

There is being laid down at the New York Shipbuilding Corp's. plant, Camden, N. J., to their own account, a twin-screw, Diesel-driven tanker of 4,000 i.h.p. which will be constructed on the Isherwood system. Two, six-cylinder, four-cycle New York-Werkspoor Diesel engines 27″ bore by 47″ stroke turning at 105 r.p.m. will be direct-connected to the propeller shaft and will give the vessel a loaded speed of 11 knots. All the engine-room equipment will be electrically driven, current being provided by two 75 K. W. Diesel generating sets and will also furnish power for the steering gear. There will be two Scotch boilers for steam heating the cargo tanks, as well as providing power for the cargo pumps and winches. Her length will be 480′ 3″ overall, by 65′ breadth and 38′ depth. She will be built to both American Bureau and Lloyds' Rules, and we understand that application has been made to the Shipping Board for a loan under the terms of the Construction Loan Fund. The trial speed of the vessel will be 11¼ knots.

WESTMOOR, the second of two 8,100 tons motorships for the Moor Line, was launched by Doxfords on September 30th. Three-cylinder, 2,200 s.h.p. Doxford opposed-piston oil-engines are installed. The sister ship VINEMOOR ran trials on September 25th, as recorded on page 828.

The Crosby Marine Construction Co. of Seattle has been awarded the contract for the 125 h.p. Sumner Diesel-engined tug boat for the Tacoma Tug & Barge Company. The Diesel engines will be built by the Todd Drydock & Construction Corporation, Tacoma, Wash.

Successful trial trip was recently run of the cargo motorship CENTAUR built for Alfred Holt & Co., Liverpool, at Scotts Shipyard, Greenock. She is of 3,000 tons gross, 315½′ long by 48½′ breadth, by 21½′ depth and is propelled by Burmeister & Wain Diesel engines.

The contract for converting the 7,057 tons Shipping Board tanker J. W. VAN DYKE, EX-ALLENTOWN to Diesel power has been secured by the Staten Island Shipbuilding Co., New York. Three six-cylinder 840 b.h.p. Ingersoll-Rand oil-engines and Westinghouse generators and motors will be installed.

Babbitt metal for Diesel engines is discussed in a booklet just issued by the Ajax Metal Co., Frankford Avenue and Richmond Street, Philadelphia. A copy will be sent free of charge to any reader writing a postcard or letter direct to John W. Alexander of the Ajax Company.

The keel of another 54 ft. tug-boat has been laid at Eriksen Bros. yard, Vancouver. This vessel will be equipped with a 100 b.h.p. at 375 r.p.m. four-cylinder, two-cycle Skandia oil-engine, and will be used by Dan King of Vancouver Pile Driving Co. as a pile driver tender.

The new 8,000 tons d.w. cargo motorship ELMWORTH, built by A. McMillan & Sons of Dumbarton for the Dalgliesh Steam Shipping Co., Newcastle-on-Tyne, was launched during September. This vessel is 400 ft. by 53 ft. by 29 2/3 ft. and is propelled by Harland & Wolff Diesel engines.

Plans were recently completed for an 85 ft. motor mission-cruiser for the Presbyterian Board of Missions in Alaska by Lee, Brintin & Wayland, naval architects of Seattle and San Francisco. The WARREN G. HARDING, as this vessel will be named, will be powered with a 150 h.p. Atlas-Imperial Diesel engine.

On September 10th the 6,500 tons d.w. Dutch motor tanker SLIEDRECHT ran trials and was delivered to the Stoomvaart Maatschappij de Maas, of Rotterdam. She was built by the Rotterdam Dry Dock Co., and a Harland-B. & W. 1,850 s.h.p. at 90 r.p.m. Diesel engine drove her at 11½ knots. Length 370′, breadth 53′, depth 28′, draft 22′ 2″.

CITY OF PANAMA, second passenger motor vessel for the Pacific Mail Steamship Company ran trials on October 4th at the Götaverken.

Knut Knutsen's 7,400 tons d.w. motorship VINLAND was launched on October 2nd at Burmeister & Wain's shipyard.

Another Large Motorship with Trunk-Piston Diesels

Weight of Complete Machinery to Drive a 382-ft. Cargo-Vessel at 11.47 Knots is Only 312 Tons

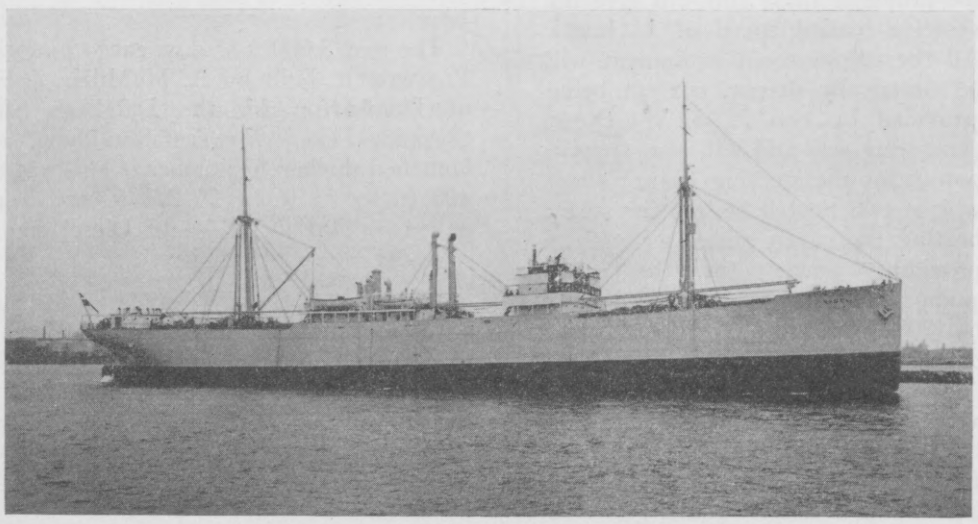
Trials of the motorship RIGEL were run on August 20th at Copenhagen, Denmark, to the order of the Bergenske Dampskibsselskab of Bergen. There are several noteworthy features about this vessel which should particularly interest American coastwise shipowners. She has a grain cargo capacity of 403,000 cu. ft. and is driven by twin trunk-piston type Diesel engines of 1,150 i.h.p. each turning at 145 to 150 r.p.m. per minute under normal conditions. But owing to a low vessel speed being required by the owners the propeller speed was reduced to 130 r.p.m. at which the engines each develop 1,050 i.h.p. This gave the vessel on trials a mean speed of 11.47 knots, after which the RIGEL started on her maiden voyage for South America loaded with cement and timber.

It is noteworthy that the total weight of this machinery is only 312 tons, including shafting, propellers, auxiliaries, tanks, air-bottles, etc., which is a remarkably low weight considering the size of the ship. Her dimensions are as follows:

Gross tonnage	3,828 tons
Grain capacity of holds	403,000 cu. ft.
Bale capacity of holds	373,000 cu. ft.
Fuel capacity	1,100 tons
Daily fuel-consumption	6½ tons
Cruising radius	45,000 nautical miles
Length, overall	382′ 0″
Length, b.p.	367′ 0″
Breadth, moulded	51′ 3″
Depth, moulded to shelter-deck	34′ 0″
Depth, moulded to upper-deck	25′ 6″
Height of double bottom	46″
Draft, loaded	23′ 2½″

Attention is drawn to the fact that it has been possible to eliminate steam completely. No donkey boiler has been installed. This was rendered possible by fitting the Lux CO_2 fire extinguishing apparatus, known in America as the Rich-Lux unit, with pipe connections to all cargo holds. Hence, the fitting of a donkey-boiler for use in case of a fire is rendered unnecessary.

All deck machinery is electrically driven, while the steering gear is of the hydro-electric type. There are eight 3-ton winches and five 2-ton winches. Power for the deck machinery, steering-gear and engine-room machinery is furnished by two 66 K.W. and one 33 K.W. Diesel-driven generator sets, anyone of which is sufficient for sea purposes, while two or three are used in port when loading and discharging cargo.



"Rigel," a new Danish-built motorship for Norwegian owners of 367 ft. length and 403,000 cu. ft. cargo-capacity driven by twin trunk-piston Diesel engines of 1,050 i.h.p. each at 130 r.p.m.

Oil Engine Manufacturing Merger on Pacific Coast

Enterprise Engine Company and Western Machinery Company Join Forces for the Purpose of Facilitating Constructional and Distributing Facilities

Bringing together two important manufacturers of small marine and stationary oil-engines, the recent merger between the Enterprise Engine Company of San Francisco, Calif., and the Western Machinery Company of Los Angeles, Calif., is a matter of considerable importance to power users on land and sea throughout the Pacific Coast section. It provides for the Western states an organization with manufacturing and distributing facilities of considerable output and one which will play a big part in meeting the engine requirements of this section up to moderate powers.

Both the principals of this merger are well and favorably known throughout engineering circles of this and foreign countries.

The Western Machinery Company is the older in point of years, of the two companies, having started in the manufacture of internal combustion gas and gasoline engines approximately a quarter of a century ago as the Western Gas Engine Corporation, at the site of their present plant number one in Los Angeles, California.

The growth of the Western Machinery Company during the twenty odd years of its existence is common knowledge. First invading local fields the company soon branched out into broader markets. Foreign distribution also eventually was decided upon and the efficiency, economy and dependability, found favor among power users in Europe, South America, and the Far East, and the Orient. With the expansion in sales, manufacturing facilities were forced to keep pace, with the result that the organization grew rapidly until at the present time there are three large factories in operation, each one fully equipped and independent of the others, producing Western Engines of various types.

The Enterprise Engine Company had its inception in the early part of the year 1916, in San Francisco, California. Like the Western Machinery Company, the product of the Enterprise Engine Company's original plant was a gasoline or distillate engine of modern type.

Natural progress in the development of their various types of engines, coupled with the changing conditions in the fuel-oil markets, resulted in the course of time in the productions by both companies of engines of the Diesel type. While the Western Machinery Company devoted most of their efforts to Diesel engines of the stationary type, the Enterprise Engine Company intensified their efforts upon the marine type, both of which are now in service in large numbers.

It was at this period in the history of both companies that the first contact of importance occurred between the parties to the present merger, an agreement being reached whereby the Western Machinery Company permitted the Enterprise Engine Company to use the Diesel engine which had been developed by the former and used to a great extent in the stationary field. This engine was changed over by the Enterprise Company to conform with marine requirements.

The officials of the Enterprise and Western companies who will be actively identified with the new organization, are as follows: Western Machinery Company: Wm. Angus, President and General Manager; George F. Guy, Vice-President; Sam Kahn, Treasurer; W. R. Hale, Secretary; J. M. Davis, Sales Manager; John H. Suter, Chief Engineer. Enterprise Engine Company: Charles J. P. Hoehn, President; H. E. Morgan, Vice-President; A. J. Martens, Treasurer; Wm. J. Donlon, Secretary; Henry Martens, Director. The headquarters of the new company will be at Los Angeles, California.

Torsional Oscillations and Their Problems

Under certain conditions the crankshaft of an engine may be exposed to vibrations of a special nature which may ultimately lead to breakage, although there are available definite and positive mathematical methods by which these conditions may be accurately determined in advance and effectually warded off.

Every power impulse from the piston of an engine slightly twists the crankshaft. Owing to the effect of the flywheel, the particular crank-pin on which a power stroke is acting will get slightly ahead of its normal position with respect to the other cranks and the flywheel. All shafts have a certain amount of "spring," particularly as far as twisting is concerned, and there is no flywheel nor any other moving mass, for that matter, which will respond instantly to an impulse for changing its motion.

Suppose the position of the crank at rest and without any strain on it were to be scribed off somewhere on the flywheel. After the engine has been started and is running steadily, the crank will periodically lead the reference mark, as already stated; but as the pressure in the cylinder dies down and the push on the crank diminishes, the flywheel catches up and will even get ahead of the crank. The twisting strain at once begins to set up a tendency to bring the crank ahead again; in other words, twisting oscillations are set up in accordance with the elastic properties of the shaft and the masses of all the moving parts, from the tip of the propeller hub to the piston crowns.

If one end of a shaft be rigidly held while the other is given a twist and then let go, the latter will oscillate back and forth a few times. Each swing, of course, is smaller than the preceding one, but the number of swings per second is absolutely constant. The mechanical principles are similar to those found in a tuning fork. Whereas the shaft rotates slightly backward and forward, the prong of the tuning fork moves from side to side and the twisting strain of the shaft corresponds to the bending strain of the fork. It is well known, of course, that a given fork always vibrates at the same frequency, no matter whether it has just been struck or whether it is nearly dying out. This is known as the natural frequency of vibration of the fork or shaft under consideration.

In an engine coupled, say, to a generator, in the case of Diesel-electric ship drive—it will be found that the entire system of moving parts, including the pistons, connecting rods, and all the shafting with the various objects keyed to them constitute an oscillatory system with a perfectly definite natural period of twisting vibration.

If it so happens that the number of power impulses acting on the system per second are the same or nearly the same as the number of twisting swings which the crank would make after having been strained and suddenly left go, a dangerous condition is likely to be set up. It is only necessary to think of the soldiers who endanger the bridge by tramping over it with a rhythm that corresponds to the natural vibration period of the structure.

There are one or more speed ranges for every engine and the machinery attached to it over which the power impulses from the working cylinders are likely to get dangerously in synchronism with the natural whip of the shaft. Unfortunately there have been several cases lately where this has actually taken place, although similar occurrences have of course been known before.

It is not one of those elusive troubles the remedies for which must be groped after in the dark. Torsional oscillations, complex though they may be, are one of the few engineering phenomena which lend themselves better to precise mathematical determination than most others. It is futile, of course, to consider the engine by itself, since its frequency of torsional oscillation is markedly affected by the shafting and all the rotating masses rigidly coupled to it. Any complete installation of engine and generator or engine, shafting, and propeller can be checked up in advance to determine its critical speed and if it is found that this is at or near the operating speed, relatively slight changes of dimensions can easily be made to throw the critical into another range. The computations, of course, are of an exceedingly involved nature, but their reliability is unquestioned. Existing installations are readily checked experimentally by means of stock instruments known as vibrographs.

New Motorship With Flettner Rudders

The German motorship KÖNIGSBERG, 9,000 tons, has been equipped with a single-blade type Flettner rudder. Trials were run on September 6th. It was found necessary to place a one-half horsepower auxiliary motor between the wheel and the planetary drive in order to overcome the frictional forces in the connecting gearing. We understand that good results were obtained on the trial.

On the previous day trials of the Krupp-engined motorship THERESE HORN of 4,600 tons d.w. took place. This vessel also has a Flettner rudder but of the three-bladed type mounted on a single rudder shaft. According to reports excellent results were obtained, under ballast conditions the vessel steering like an automobile. The diameter of the smaller circle was only two lengths of the ship, and the rudder wheel could be moved with rapidity and ease from port to starboard and vice versa, which should be a good factor in controlling yawing.

French Motorshipping Notes

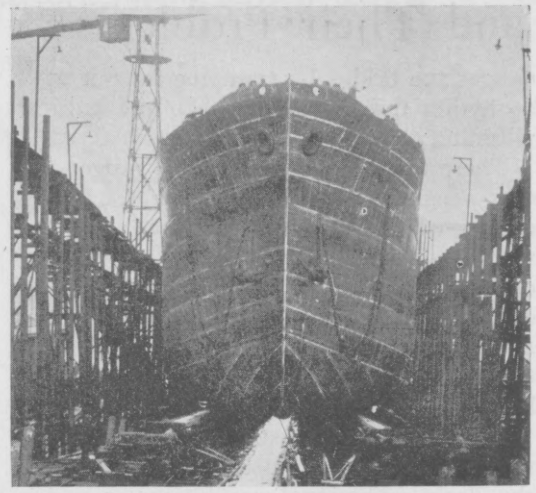
Some months ago we reported that the Chantier et Ateliers de Saint-Nazaire, Penhoet, who for many years have held a Dutch Diesel license, had acquired a license for the construction of the Burmeister & Wain Diesel engine in France, the latter license having previously been held by Delaunay-Belleville of St. Denis-sur-Seine. The Saint Nazaire-Penhoet Company are to construct the Burmeister & Wain Diesel engine for the big passenger-cargo liner for the Companhia Nacional de Navegacao of Rio de Janeiro, Brazil, as well as the B. & W. engine of a freighter for Wilhelm Wilhelmsen of Tönsberg, Norway.

It is interesting to note that this well-known French shipbuilding company have also held for many years a license to build M.A.N. Diesel engines and at present are constructing a six-cylinder 1,400 b.h.p. Diesel engine of this design for experimental purposes, and with a view to possible adoption of this make of engine on some ships built in the future. Meanwhile the engine in question will be used for power-plant work at the Penhoet Works.

It may be mentioned at this time that the Saint Nazaire Penhoet Company are likely to construct for the French Navy B. & W. type Diesel engines for a new 6,080 tons d.w. 13.5-knot tanker which may be built at the Le Trait yard (near Rouen) of the Chantiers et Ateliers de la Seine Maritime. No little stir has been aroused in French shipbuilding circles in connection with the forthcoming new naval order.

The French Navy has acquired the Nicolaieff-built motor-tanker BAKOU which formerly belonged to General Wrangel's Russian fleet. She has Krupp Diesels.

In our October issue under the heading "Motorship Construction in France" it was stated that the three ships ordered from the St. Nazaire Shipbuilding Company's Penhoet yard by the Companhia Nacional de Navegacao Costeira, Rio de Janeiro, were to have Diesel engines. However the owners have decided to install Diesel engines in one vessel only, and equip the other two with steam, because of the shortage of Diesel operating engineers in South America. Plans of these vessels were published on page 352 of our May 1923 issue, and a description was given on page 335.



Launch of the motor-tanker "Varanger"

Big Dutch-Built Motor Tanker Launched

Recently there was launched the largest Diesel-driven ship yet constructed in Holland, namely, the VARANGER, built by the Netherland Shipbuilding Company of Amsterdam for Westfal-Larsen & Co., Bergen, Norway. She is one of two motor-tankers building at this plant for the same company —the NORDANGER being the sister vessel. Both ships are of 12,750 tons d.w. and are propelled by twin 1,800 i.h.p. Werkspoor Diesel engines of their new cast-iron frame construction design—which design was recently described and illustrated in MOTORSHIP.

World Shipping Outlook Considered Brighter

Leaders in European shipping are taking a slightly more optimistic view of the situation, according to E. S. Gregg, chief, Transportation Division, Department of Commerce, who has just returned from Europe. Their optimism, however, is restrained and is not related to the strengthening of rates within the last few months, a tendency which may be attributed largely to seasonal influences. Their forecast is that the idle tonnage of the world may be completely reabsorbed into trade within from three to five years.

A number of facts support this view. The idle steam tonnage of the world has declined from over 11,000,000 gross tons on January 1, 1922, to about 6,000,000 tons on July 1, 1924. If this absorption continues, all idle tonnage would again be in employment in less than four years. The actual position is stronger than the statistical position. Another supporting fact is that ocean freight rates, have remained fairly steady for the last two years.

Until some marked revival occurs in shipping, the shipbuilding industry of the world will continue in its present unsatisfactory state. New construction is at one of the lowest points in several decades. The bright aspect of the situation is the steadily increasing construction of motorships and the rapid development of improved types of Diesel engines.